

MODEL ★ AIRPLANE NEWS

48120

AN AIR AGE
PRICE
\$2.95
PUBLICATION



Dean
Olson

RY 1991 Canada \$3.75



• KG-"BACK TO THE
FUTURE"

• RUBBER POWERED
R/C Flies Great!

• OSHKOSH '90

• Glassing Wings

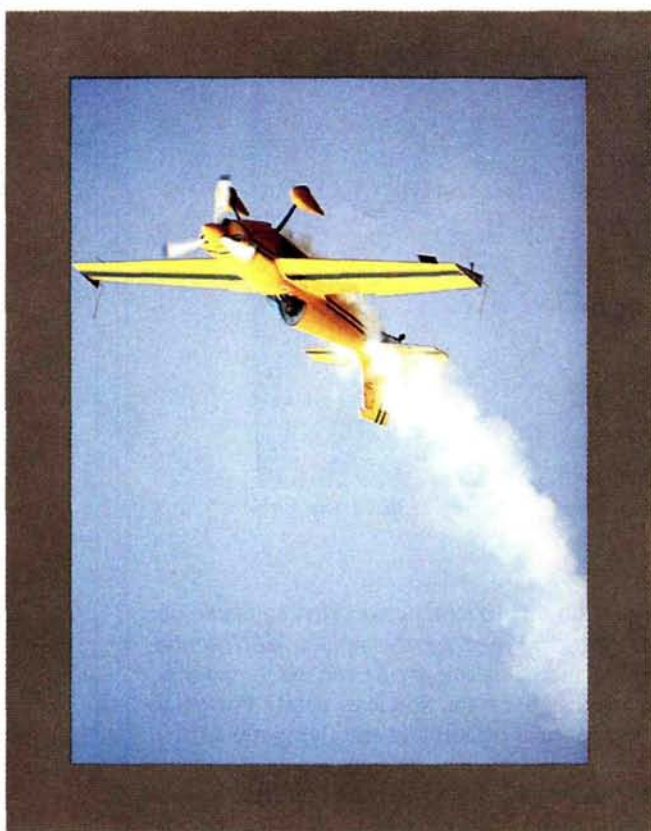
MODEL AIRPLANE NEWS

FEATURES

- 37 Midwest Electric Hots**
by John Lupperger
A Field & Bench Review
Is this the hottest?
- 44 Introduction to Scratch-Building, Part II**
by Dan Santich
Install "baggage" safely!
- 48 Fiberglassing Sheeted Wings**
by Frank Tiano
Part II of a "Sporty Scale" Special.
- 50 Build a Solar-Powered Ni-Cd Starter Charger**
by Joe Cloud
Let the sun do the work
- 56 Oshkosh '90**
by Rich Uravitch
What could they do to top last year's event?
- 69 Joe Kovel's Pioneering KG**
by Frank Gudaitis
It led the way to gas-powered flight
- 81 Cox Hobbies Fairchild 24 ARF**
by Rich Uravitch
A Field & Bench Review
—hours of good, 1/2A fun
- 88 R/C Warbirds Over Orlando**
by Wally Zober
—a gathering of eagles!

HELICOPTER SECTION

- 91 Contents**



ON THE COVER: this winter aeromodeling scene by Jean Oldham was first published on the cover of our January 1930 issue.

- 92 Hirobo Condor 60**
by Datu Ramel
A Pad & Bench Review
Hot-dog, hover, or compete

- 96 Rotary-Wing Roundup**
Manufacturers share their latest products

- 98 Understanding Chordwise Center of Gravity**
by Paul Tradelius
—a way to obtain more predictable performance

- 102 Helicopter Challenge**
by Craig Hath
Achieve CRS with some popular, available radio systems

CONSTRUCTION

- 29 Rubber Guppy**
by John Valls
Rubber-powered R/C with a new twist

COLUMNS

- 10 Fifty Years Ago**
by Brenda J. Casey

- 14 How To: Make a Bar Clamp**
by Randy Randolph
- 16 Air Scoop**
by Chris Chianelli
Our spy brings you the lowdown
- 20 Giant Steps**
by Dick Phillips
- 64 Sporty Scale Techniques**
by Frank Tiano
- 74 Golden Age of R/C**
by Hal deBolt
A Special Report on the Selinsgrove Re-enactment
- 85 Building Model Airplanes**
by Joe Wagner
- 122 Small Steps**
by Randy Randolph

DEPARTMENTS

- 6 Editorial**
- 8 Airwaves**
- 22 Hints & Kinks**
by Jim Newman
- 24 Pilot Projects**
- 109 Club of the Month**
- 112 Product News**
- 120 Plans Mart**
- 126 Name That Plane**
- 130 Ad Index**

EDITORIAL

by TOM ATWOOD



Editor Tom Atwood (center) helps a newcomer to the hobby with his first flight.

THE WINTER SCENE depicted on this month's cover first appeared on the front of our January 1930 issue—60 years ago this month. *MAN*, which began in 1929, is the oldest, active, modelers' magazine and one of the oldest magazines in general (no wonder, given the timeless, nearly universal appeal of aviation and the diverse rewards of building and flying model airplanes).

In this issue we go full circle (back to the future) to report on Joe Kovel's revolutionary KG—a plane first shown in these pages in 1935 and one of the catalysts of the gas-powered era. Our thanks to Joe and the AMA museum, who provided archival material for the reproduction of the full-size plans. For those with an appreciation of the historical side of the hobby, see also our coverage of the Selinsgrove Re-enactment and our construction article on the Rubber Guppy, which combines the time-honored rubber "motor" with R/C.

The future of the hobby is as much on our minds as its past. The October 18 to 21 Chicago Model Hobby Show, which was sponsored by RCHTA (Radio Control Hobby Trade Association) indicated great things to come. Over 400 vendors (including Air Age Publishing) attended, with such surprises as all-new warbird kits from several major manufacturers, new computer radios, new giant-scale kits from Europe, a canard electric sailplane and even a rocket-powered R/C plane. We'll be bringing you coverage of these—and many more new items that appeared at the show—in future issues.

The future of the hobby, of course, also depends on newcomers to our ranks. How much bigger would aeromodeling be if it were easier to learn to fly R/C? Are we doing as much as we could to bring in new blood? In upcoming issues, we'll look at several of the new trainers, some of the flight-simulation software available to neophyte R/C fliers, and at approaches to training new fliers. Stay tuned also for the winner of 1990 "Pilot Projects" contest, to be announced in the next issue.

Group Publisher
LOUIS V. DeFRANCESCO, JR.
Publisher
DR. LOUIS V. DeFRANCESCO
Associate Publisher
YVONNE M. MICK

Editor-in-Chief
TOM ATWOOD
Associate Editor
CHRIS CHIANELLI
Copy Director
LYNNE SEWELL
Copy Editors
KATHERINE TOLLIVER
BRENDA CASEY
Assistant Copy Editor
LAURA M. KIDDER

Art Director
ALAN J. PALERMO
Associate Art Director
MARY LOU RAMOS
Assistant Art Director
BETTY KOMARNICKI
Art Assistants
MICHAEL MAKUCEVICH
STEPHANIE L. WARZECHA
Staff Photographer
YAMIL SUED

Systems Manager
ED SCHENK
Systems Assistant
JACKIE MOSIER

Circulation Manager
KATHLEEN RHODES
Circulation Assistant
ANN MATREGRANO

Production Coordinator
MARY REID

Advertising Sales Director
JASON STEIN
Advertising Sales Coordinator
JULIA PEMBERTON
Advertising Traffic Assistant
KYRA MATERASSO

SUBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): 1 year (12 issues), \$24.95; 2 years (24 issues), \$45.95. Outside U.S.: 1 year, \$34.95; 2 years, \$65.95. Payment must be in U.S. funds.

SUBSCRIPTION INQUIRIES: call 1-800-435-0715.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. Mick, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices. Copyright 1990 by Air Age, Inc. All rights reserved.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by a SASE will be returned.

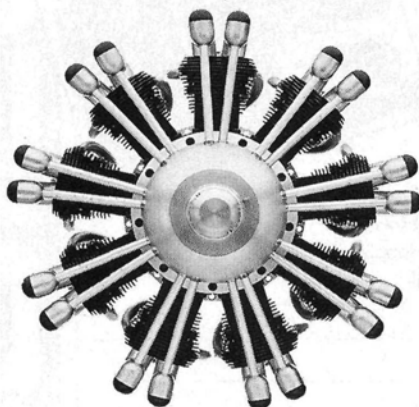
ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: (203) 834-2900. FAX: (203) 762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

THEY'RE BEAUTIFUL.

They're also powerful, reliable and precise. Any of the fine scale radial engines from Technopower II will add realism like nothing else can. See for yourself, today.



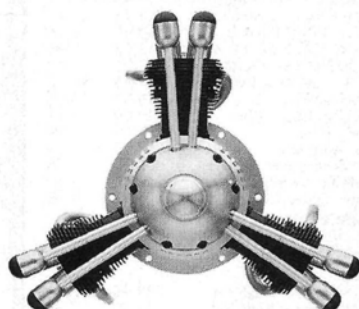
9 Cylinder "C" Series
73 Ounces • 4.0 Cubic Inches • 9" Diameter



7 Cylinder Big Bore Series
30½ Ounces • 2.0 Cubic Inches • 6½" Diameter



5 Cylinder Big Bore Series
26 Ounces • 1.39 Cubic Inches • 6" Diameter



3 Cylinder
30 Ounces • 1.35 Cubic Inches • 8" Diameter

TECHNOPOWER II INC.

610 North Street, Chagrin Falls, OH 44022
Telephone (216) 564-9787
Complete Brochure \$3.00 • Visa & MC Accepted

©1990 TECHNOPOWER II INC.

AIRWAVES

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

We neglected to give credit to Darryl Spaulding for some of the photos in our November '90 article, "Ace Bipe Becomes a Curtiss P-6E Hawk" by James E. McQueen. Our apologies to him.

I NEED AN ANSWER!

I'm stationed in Turkey with the US Air Force. As a newcomer to R/C planes, I have a few questions. First, what do "giant scale" and "stand-off scale" mean, and what are the other scales, if any? Second, I've been building plastic models for 17 years, and I recently built a Grumman J2F-2 "Duck." Is there an R/C kit or a plan available? This would be an excellent model for an experienced builder/flier; because it's amphibious and also has retractable main gear, it gives you the best of both worlds.

Since I'm in Turkey, I'm completely dependent on our bookstore for your magazine, which I feel has more useful information than others. I check every day to see if new issues have arrived. Can you recommend a reliable mail-order company?

SGT. CHARLES A. COOPER
Incirlik AB, Turkey

Charles, the basic categories include sport scale, giant scale, fun scale, precision scale and FAI scale. The AMA rule book defines as "sport scale" (also referred to as "stand-off scale") any model with a maximum engine displacement of 1.25ci (or 2ci, if a 4-stroke) or a maximum weight of 20 pounds. Anything heavier (up to a ceiling of 55 pounds) is deemed "giant scale." Under the rules, giant scale includes planes with engines of more than 1.25ci or planes of a scale that's larger than 27/8 inches to 1 foot. Planes that weigh more than 55 pounds are considered "experimen-

tal." If you think this sounds as if you can have a sport-scale plane that weighs more than a giant-scale plane, you're right.

Fun scale is basically a flying event. To enter, you only need your model and a photo of the full-size plane—even the box art may be acceptable. Get a copy of the AMA competition handbook for more details on all these categories.

The Grumman J2F-2 is, indeed, a beautiful plane. We were unable to unearth a source of kits, but if you'd like to check plans, try these: Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; Cleveland Quality Plans, c/o Cleveland Model & Supply Co., 103075 Detroit Ave., Cleveland, OH 44102; John Pond's Old-Time Plans Service, P.O. Box 90310, 253 N. 4th St., San Jose, CA 95109; Scalecraft, PO Box 4231, Whittier, CA 90607; Scale Plans & Photo Service, 3209 Madison Ave., Greensboro, NC 27403.

TA

USED PARTS

I have an older model O.S. Max .25 engine. In a recent crash, I burned my trainer and did a fair amount of damage to my little engine. It looked easy to repair, though. Damage was limited to the muffler, which needs to be replaced; the carburetor, which I can still replace; and the right engine lug, which I will fix in accordance with your article on how to fix broken lugs (September's "Hints and Kinks").

I'm sure other readers who have older, outdated engines would like to know where they can get parts for their engines that still work fine. I can't afford a new engine. I bought this engine about eight years ago for around \$45, with a muffler. The newer model would cost around \$70. As a student, I don't want to spend

that much on a new engine when I have a perfectly good one that still works and simply needs a new muffler. Who can I contact to get old parts? Oh, yeah! I almost forgot! I'm a regular reader of your magazine, even though I don't subscribe. It caters to my needs.

JEFF TURK
Corpus Christi, TX

Jeff, the O.S. Max .25 is indeed a tough little engine. Mine is several years old, and although it's been crashed on more than one occasion, it still runs well. The damage you've suffered isn't uncommon, nor is your need for replacement parts. A quick call to the O.S. people at Great Planes revealed that O.S. doesn't stock used or damaged parts for out-of-production engines. To save some bucks, I suggest that you try swap shops at modeling shows or contests, or ask at your local hobby shop. The owner may have a used muffler, or know of someone who does.

TA

ABSENT ALBATROS

I've recently become interested in building a WW I Albatros, but I'm unable to find plans for any version. Do you know anyone who has plans for sale? I look forward to hearing from you soon.

JOHN CARLSON
Robbinsdale, MN

John, Airdrome offers plans for the Albatros D-II and D-III for \$12 each. The D-III has a 34-inch wingspan; it uses 3 channels; and it's powered by an .09 glow engine. The D-II comes in two sizes: a 27-inch span for an 02 electric (3-channel) and a 54-inch span for a .45 glow engine (4-channel). Write to: Airdrome, Box 1425, FDR Station, N.Y. 10150.

You can also find scale documen-

tation for the D-111 in our "Scale Aircraft Drawings," Vol. 1, WW I, page 7. Drawings of the Albatros are also available from our archives. See page 44 of the MAN Plans Directory, which we published in our December '90 issue. TA

FINDING FOAM

I'm building a deHavilland DHC-2 Beaver from a set of MAN blueprints. The floats will be built of foam.

I recently purchased the October '90 issue of MAN. John Sullivan's article on glassing foam floats tells me everything I wanted to know, except for a supplier of the (BASF 322) foam-core. I tried a test set with the large-bead foam, but I wasn't satisfied with the results. I've exhausted all my sources in this area, so any help you could provide would be extremely appreciated.

DAVID P. BARTER
Wiscasset, ME

David, we called John Sullivan and asked about his supplier. He said that the BASF foam was the best, but it's very expensive in small quantities (about \$.15 a board foot). For the average modeler who wants to build his own floats, any 1-pound-per-cubic-foot polystyrene foam will do. It can be cut very easily with a band saw, a kitchen knife, or a hot wire. Polyurethane foam (brown) of the same density can also be used, but it shouldn't be cut with a hot wire because it produces highly toxic fumes when heated. You can also call or write to Mr. Sullivan for more information: 1421 Second St., Calistoga, CA 94515; (707) 942-5095.

TA

(Continued on page 12)

Learn to fly in Paradise!



Now you can learn to fly R/C in one of the most beautiful places on earth and make a true family vacation of your experience.

Paradise Flight School offers you competent, professional instruction. You'll learn essential flight skills the crashless way from seasoned instructors. Our comprehensive weeklong course guarantees you'll *return home a better pilot* and you'll be tanned and well rested to boot! Your morning flying sessions will have you back at your hotel by noon so you'll have the rest of each day to explore the exotic playground of Oahu with your wife and family.

And **Paradise Flight School** is surprisingly affordable: the cost of our weeklong program is equivalent to comparable tour packages. But it's a whole lot more fun! Call or write today for our free brochure to find out how you can become a better pilot... in paradise!

Paradise Flight School
851 Pohukaina, Building C-2
Honolulu, Hawaii 96813
(808) 523-1545



FIFTY YEARS AGO

BELIEVE IT OR NOT!

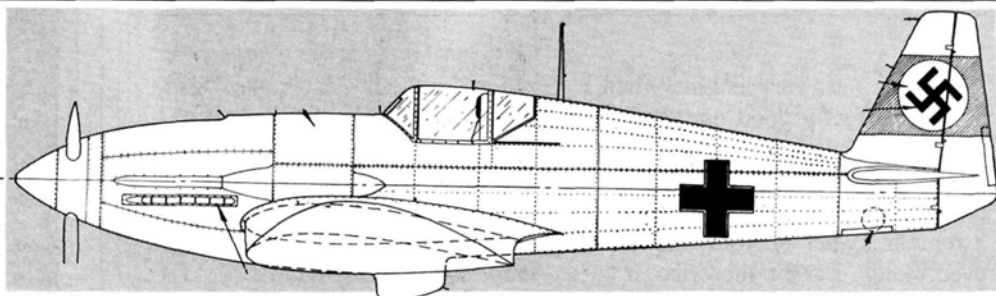
by BRENDA J. CASEY



WHAT CARRIED aloft Sinbad the Sailor and the pilots of the Royal Navy? Give up?—the Roc, which was the subject of *MAN*'s cover story in January 1941! After the Boulton & Paul Defiant had proved so deadly at Dunkirk, Britain put the Blackburn Skua through a redesign/re-armament program, and it emerged as the Roc—a deadly fighter/dive bomber.

This low-wing, two-seater monoplane was one of the most heavily armed fighting planes in the world! It had two free-firing machine guns in each outer wing panel, and four 30-caliber ones amidship in the famous Frazier-Nash power-driven turret. The Blackburn Roc was capable of 8,000 rounds a minute—that's some fire power!! As if that wasn't enough, the plane also carried bombs (one 800-pounder was used on enemy fleet missions!). In a vertical bombing dive, with the four wing guns firing, this was a very dangerous ship.

It had other special fea-



The iron cross and the swastika—two symbols of "famine, pestilence, death and devastation" in 1941.

tures, too, including multipurpose hydraulic flaps that acted as landing decelerators, dive brakes and climbing aids on takeoff. Although the Roc had a wingspan of more than 46 feet, its three-section wings folded to only 15 feet, 6 inches to facilitate carrier-deck stowage. The Roc was powered by a single, 9-cylinder, Bristol "Perseus" Mark XII—the sleeve-valve engine for which Britain was famous. Its inlet and exhaust ports were alternately opened and closed by holes in the piston passing holes in the cylinder walls.

IS THIS A POP QUIZ?!

History teachers could have used the "Know Your Warplanes by Their Insignia" article as a pop quiz. Most people probably recognize the German swastika, but the Nazis also used

a white-bordered iron cross on their planes. Do you know which country used three black rod bundles, each surrounding an axe, in a white circle with a black border? Hint: the emblem once stood for the "power to enforce the law through flogging or beheading!" Which two countries use a red, white and blue cockade? (The second country's "bull's eye" is encompassed by a yellow outer circle, and its night-bombing machines omit the white ring so they won't be picked out by enemy searchlights.) If you recognized Italy's Fascio Littorio and guessed France and Great Britain, you're right! (By 1941, the Royal Air Force was also using "shadow shading" on its planes, e.g., sky blue on the bottom and brown and green camouflage on top,

so they would be hard to see from above and below!)

Think you're pretty smart, huh? How well do you know your "stars"? Which country's emblem (also part of the state seal) is a red star? How about a white circle and twelve white points on a circular blue background, or a red circle in a five-point white star inside a larger blue circle? Bonus question: which country's insignia is a solid red ball? If you answered Russia, China and the USA, and you knew that Japan uses the "Hinomaru," or red sun, on its planes, you're either an aviation-history or war-movie buff, or you're old enough to have gone to Saturday afternoon movies back in the '40s and have a vivid memory of the newsreels!

MORE THAN ONE FOR RIPLEY!

Model builders were up to their old tricks in 1941. They were experimenting with all sorts of things, including leading-edge slots, square-ended box wings, automatic stabilizing devices, canard gas models and tailless planes



A man-dwarfing gas job and a plane that fits in the palm of your hand?!

with no sweepback. One clever reader even used trick photography in his "Gas Lines/Air Ways" entry; is it a midget model builder spinning the prop of his gas job, or a full-size man and a giant plane?!

Speaking of miniaturization, Allan Kitchel Jr.'s WW I "scales" were certainly unique. It all began in 1931 with a mini model of Baron von Richthofen's all-red Fokker Triplane. Soon there were 36 1/8-inch-scale planes in Al's "sizable" collection, which included Sopwith Camels, Nieuports, a Curtiss "Jenny" and an Albatros—all with wings of between 3 and 8 inches! The models survived 9 years in a box in a closet before they were photographed by Universal's "Stranger than Fiction" and displayed at the Empire Trust Co. in New York.

Here's another one for "Believe It Or Not": Barney Snyder built an impressive plane with motor, wings, tailplane and landing gear...from a cardboard carton! I've heard of building a model kit, but never a model-kit box!



Ed Lidgard and his world-record flapper.

A FORTIES FLAPPER

Ed Lidgard's construction article was just as unusual; he told *MAN* readers how to build his world-record-holding (with a flight of just over 3 minutes) ornithopter. In 1936, members of the Chicago Aeronauts had experimented with "flappers" they built from *MAN* plans—adding, discarding and changing things. To make your own model based on their findings, all you needed was 12 hours and 10 cents!

(Continued on page 54)

EASY TO GET ALONG WITH AT ANY SKILL LEVEL!



Wing Span: 78-1/2" (2M)
Wing Area: 648 Sq In
Weight: 28 Oz
Wing Loading: 6.2 Oz/Sq Ft
Airfoil: SD7032
Functions: Three Channels;
Elevator, Rudder, & Flaps

EASY EAGLE

Designed by Harley Michaelis

The Easy Eagle is easy to get along with, whether you're starting on your first plane, are an experienced sport pilot, or a competition-oriented veteran needing the latest technology to keep up.

With an SD7032 airfoil equipped with flaps, you can maximize gorilla launches, find the lightest lift, hang on a wing tip in turns, and slow down enough to nail the spot on landing.

Other features include high prefabrication for quick assembly, gapless hinge lines for clean airflow, bolt-on wing, and complete hardware.

50K233 Easy Eagle 2 Meter Glider \$54.95

How to get your Easy Eagle kit!

See your dealer first! If he cannot obtain one, you may order directly from Ace R/C at the address below; add \$3.00 P&H with order. Complete catalog \$2.00.



ACE R/C

116 W. 19th St., P.O. Box 511 Dept. #2120, Higginsville, MO 64037 816.584.7121

major decals



DECALS

PRESSURE SENSITIVE • WATER TRANSFER
Authentic model insignias (pressure sensitive or water transfer) for 1/4 scale, .40 and .60 size propeller decals, World War II kill markings, stars, flags, letters, numbers and trim sheets.

Over 750 To Select From

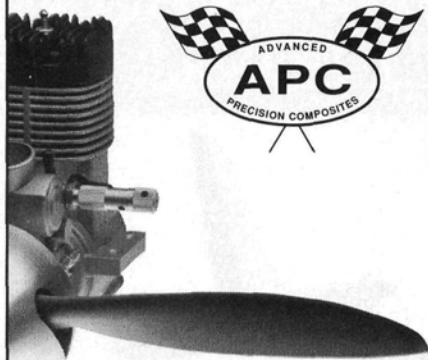
- ★ 7 1/4 Scale (18 Sheets)
- ★ .60 Size (38 Sheets)
- ★ .40 Size (38 Sheets)
- ★ Propeller Decals . W.T. only (6 Sheets-3 sizes on ea.)
- ★ Kill Markings W.T. only (6 Sheets)
- ★ Nomenclature Markings (3 Sizes-12 Sheets) in Black or White copy
- ★ Letters and Numbers (1/4"-3/8"-1/2"-5/8"-3/4"-7/8"-1"-2"-3"-4"-4-13/16" in 10 Colors, See color chart.)
- ★ Flags (American, United Kingdom and Confederate)
- ★ Stars in 10 Colors (9 Sizes plus one Sheet of Assorted Sizes)
- ★ Trim Sheets (4-3/4" x 26" in 10 Colors, see color chart)

Send \$2.00
for brochure

major decals

FUEL PROOF TESTED 12%

NORTHEAST SCREEN GRAPHICS 21 FISHER AVE., EAST LONGMEADOW MA. 01028 TEL 413-525-4110



APC PROPELLERS

- Sound Suppression Design
- High Thrust Efficiency
- Long Fiber Advanced Composite Material
- Proven Performance at US Masters, US Nationals, Canadian Nationals, and World Championships

Sports Sizes

5.7 x 3, 7 x 3, 7 x 4, 7 x 5,
7 x 6, 7 x 7, 7 x 8, 7 x 9,
7 x 10 **\$1.59 EACH**

8 x 4, 8 x 5, 8 x 6, 8 x 7,
8 x 8, 8 x 9, 8 x 10 **\$1.79 EACH**

9 x 4, 9 x 5, 9 x 6, 9 x 7,
9 x 8, 9 x 9, 9 x 10 **\$1.99 EACH**

9.5 x 4.5, 10 x 6, 10 x 7,
10 x 8, 10 x 9, 10 x 10 **\$2.29 EACH**

11 x 6, 11 x 7, 11 x 8, 11 x 9,
12 x 6, 12 x 7, 12 x 8, **\$ 2.89 EACH**

Competition

11 x 10, 11 x 11, 11 x 12,
11 x 12W, 11 x 13, 11 x 14,
12 x 9, 12 x 9W, 12 x 10,
12 x 10W, 12 x 11, 12 x 11N,
12 x 12, 12 x 12N, 12 x 13,
12 x 13N, 12 x 14 **\$7.95 EACH**

13.5 x 12.5, 13.5 x 14, 14 x 8,
14 x 10, 14 x 12, 14 x 14,
14.4 x 10.5, 14.4 x 12 **\$12.95 EACH**

"Contact your local hobby dealer"

Manufactured by Landing Products
Knights Landing, California

AIRWAVES

(Continued from page 9)

TA-152H CONVERSION

I've just read the request by Larry Hix in your September issue for plans for various planes. I've been out of the sport for some 30 years (spark plugs, ignition systems, escapements, silkspan, dope, hand-cranking, etc.), and now that I've retired, I want to build a model of the WW II plane that I've admired for a long time. I'm currently drawing plans for the Focke-Wulf TA 152 H using two sources of photos and drawings. The plans are in Apple's Macintosh Draw formats, and they can be scaled to any size. The size I'm working on yields an 87-inch-span model. The actual span is 47 feet, 4 1/2 inches, so it's about 6.5-percent scale. I bought a Pica FW 190D model as a basis for the design, but I can't use as many parts as I had hoped. Other kits would be the same. The fuselage is longer in front of the cockpit, but behind that area, I'm using the kit pieces. The wing is wider—all new. The fin/rudder is changed to the "H" size and will be built-up, as will the stabilizer/elevator. Plastic parts used from the kit are the cowl, the canopy and the supercharger intake. The fuselage machine-gun hatch may be used if it can be modified to eliminate the M/G blisters. (It would be nice if the kit had the wing-mounted cannon blisters.)

I sent for the Cockpit Kit from Pica, and I have a sketch of the cockpit interior. I bought a Fox Eagle 74 for a powerplant. The engine was selected with the idea of rotating the cylinder so that the exhaust faces the rear and running header pipes to the fuselage exhaust pipes. It's a little tall for the cowl. I'll write to Duke about cutting down the head and cutting more circular fins in it to keep it cool.

The plans are about 90-percent finished, and as I don't have access to a plotter, I can print them out on fan-fold paper. I'm also interested in the

FW-189, but I haven't seen anything on it. I like your mag, and I ordered a subscription. Mahalo for your time.

JOE CUNNINGHAM
Kailua-Kona, HI

Thanks for the information, Joe. We'll forward your letter to Larry, and maybe you two can brainstorm the new design. Good luck, and when you've finished, be sure to send a photo to our Pilot Projects department.

TA

A WART HOG FOR A FRIEND

A very close friend of mine has recently been sent to Saudi Arabia. He has been like a brother to me. I've been asked not to disclose his squadron, but he's part of an A-10 ground-support wing. He became involved with R/C planes this year and has started quite a collection. I'm new to R/C planes, and I have little experience finding answers to R/C questions. I have a good model-building background, so building an R/C plane should be relatively painless.

My goal is to build an R/C copy of my friend's A-10 Wart Hog for him. My main problem is finding a good kit to work from. Are there any manufactured kits, or any really good plans available? Any information and/or help in this matter would be greatly appreciated.

KEITH WILSON
Glassboro, NJ

Keith, we looked high and low for kits and came up short. There's a kit and plans imported from England by Jim Fox Models (tel: 0482-861795). Larry Wolf of Jet Hangar Hobbies (tel: 213-429-1244) suggested that you try Mike Bleuieau, who also sells plans (84 University

St., Presque Isle, ME 04769; tel:
207-768-3471). Hope this helps!
TA

MAIL-ORDER BUILDER WANTED

I come from Papua, New Guinea, but I go to school in Australia. I get my *MAN* magazine monthly, and I find it very interesting.

I bet you've been getting a lot of questions about the 1/2A Fantrainer, but my question might seem strange. First, I'm 16 years old, and I go back four times a year to New Guinea, which is where I work on my hobby. Do you know anyone who would be interested in making me a model of the 1/2A Fantrainer that's covered and has an engine and a radio? I'd be willing to pay around \$150.

I ask such a strange question because in Papua, it's hard to get the right equipment to build a plane.

SUDEEP JACOB
Box 494 - E.S.P., Wekak
Papua, New Guinea

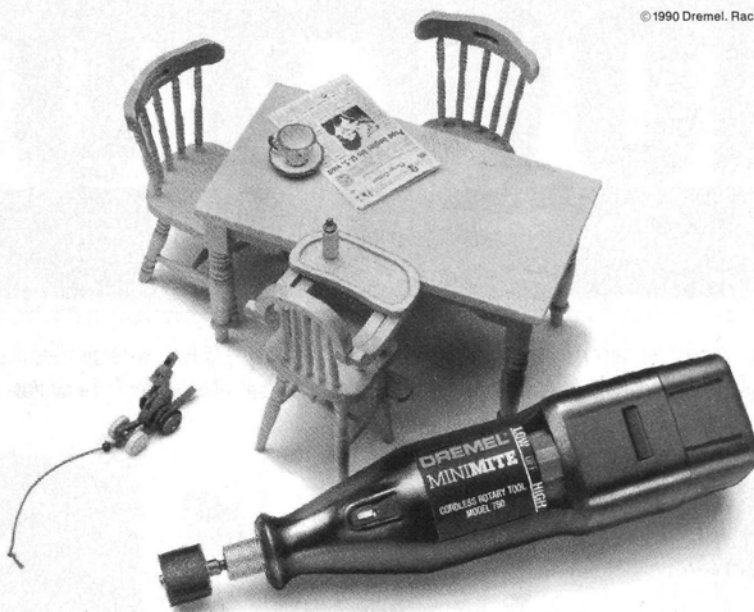
Sudeep, you may have to negotiate price, if the project is to include an engine and a radio—and cost of shipment! I've included your address, and I hope one of our readers will be interested in helping out.
TA

FLYING IN L.A.

For over a year, I've been flying my R/C trainer in schoolyards and parks, because they're about the only places in south central L.A. where a 15-year-old can go where there are no cars. Now that I've bought a Formula Racer, I don't think it's safe to fly where I

(Continued on page 18)

©1990 Dremel, Racine, WI



The perfect tool for small families.

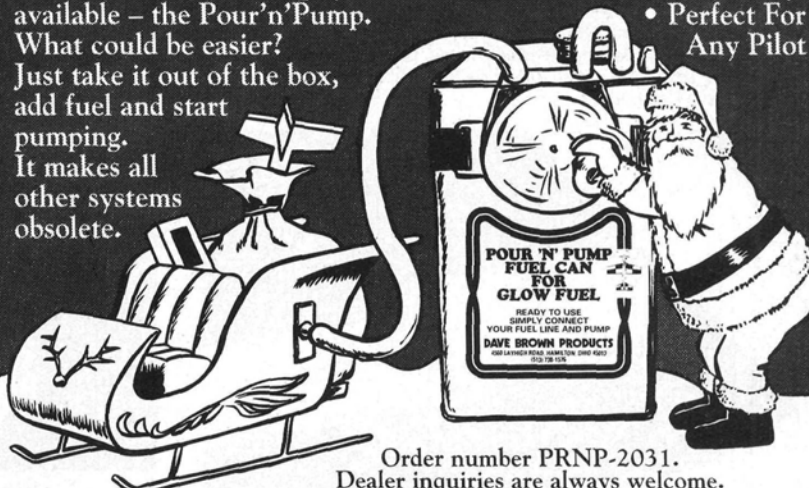
Introducing the new MiniMite from Dremel®. The smallest cordless power tool with a removable, rechargeable battery pack. It has two speeds and five Dremel bits, including a sander for the hard-to-reach areas of any house.

MINIMITE™
Cordless Rotary Tool from Dremel

WHEN IT IS TIME TO FLY, EVEN SANTA KNOWS HOW TO FILL-UP.

Santa knows that when it is time for flying, the last thing you need is a fueling problem. That's why he uses the most reliable fueling system available – the Pour'n'Pump. What could be easier? Just take it out of the box, add fuel and start pumping. It makes all other systems obsolete.

- Durable Metal Can.
- All Fittings Installed.
- Rugged Pump Fills All Tanks Quickly.
- Perfect For Any Pilot



DAVE BROWN PRODUCTS

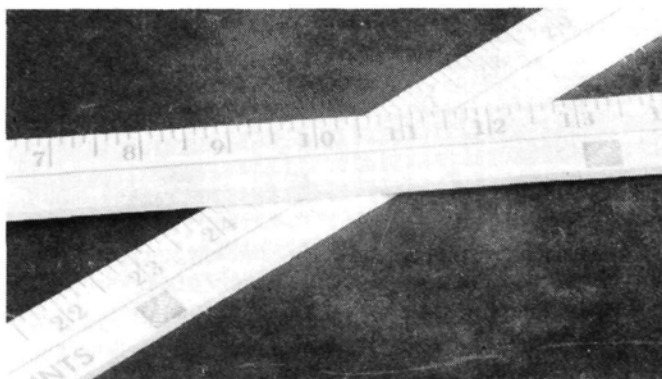
4560 Layhigh Rd., Hamilton, Ohio 45013 • (513) 738-1576 • Fax: (513) 738-0152

HOW TO:

by RANDY RANDOLPH

MAKE A BAR CLAMP

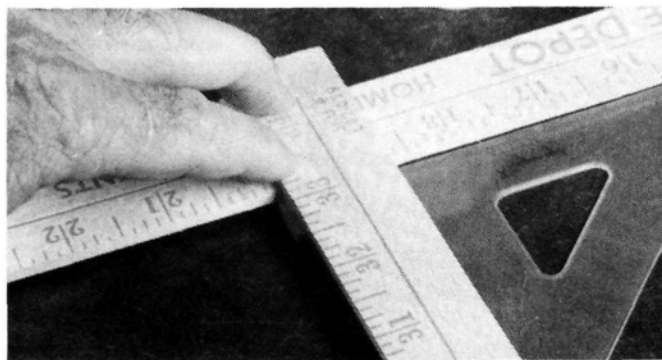
Sliding bar clamps are very handy, and this one works especially well to hold fuselage sides in alignment while you install the bulkheads and the firewall. Best of all, the materials cost less than 50 cents, and in some cases, they're free! The photos show you how.



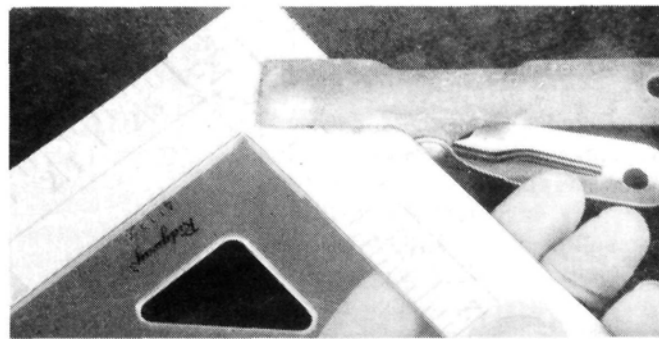
1. The basic building materials—inexpensive advertising yardsticks that are available at most lumberyards and hardware stores. Select ones that are straight and have true edges.



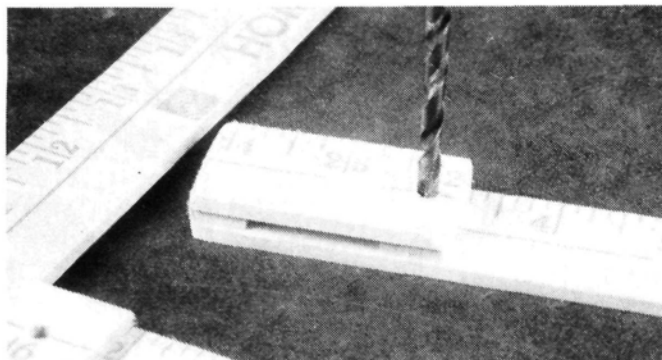
2. Cut a 12-inch length of yardstick for the bar, and one 2-inch length and two $\frac{1}{2}$ -inch lengths for the slide. Position the 2-inch-long piece crosswise under the bar, then fit the two $\frac{1}{2}$ -inch pieces on top of it (snug against the bar), and glue them to the bottom piece. Don't glue them to the bar.



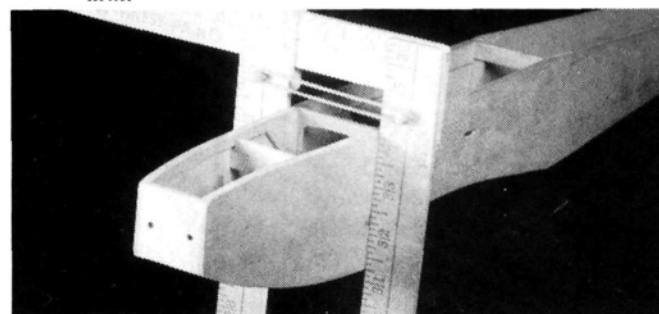
3. To complete the sliding arm, cut a 10-inch piece and glue it to the tops of the two $\frac{1}{2}$ -inch pieces. Use a square to position the arm at a right angle to the bar. Remember: don't get glue on the bar.



4. To form the fixed arm, cut the remaining yardstick piece to 10 inches and place it over one end of the bar. Use a square to make sure that it's at a right angle to the bar, and then glue it into place. Slide the small remaining piece underneath so it's snug against the bar, and glue it to the fixed arm.



5. Drill $\frac{3}{16}$ -inch holes in both the fixed arm and the sliding arm just below the bar. Glue 1-inch pieces of $\frac{3}{16}$ -inch hardwood dowels through both holes, and center them in the arms.



6. To clamp your work, put rubber bands around the dowels and in notches cut in the bottom of the arms. Use as many bands as necessary to achieve the required clamping pressure. (The dowels can be eliminated if the fixed arm is extended $\frac{1}{2}$ inch above the bar and notched.)

AIR SCOOP

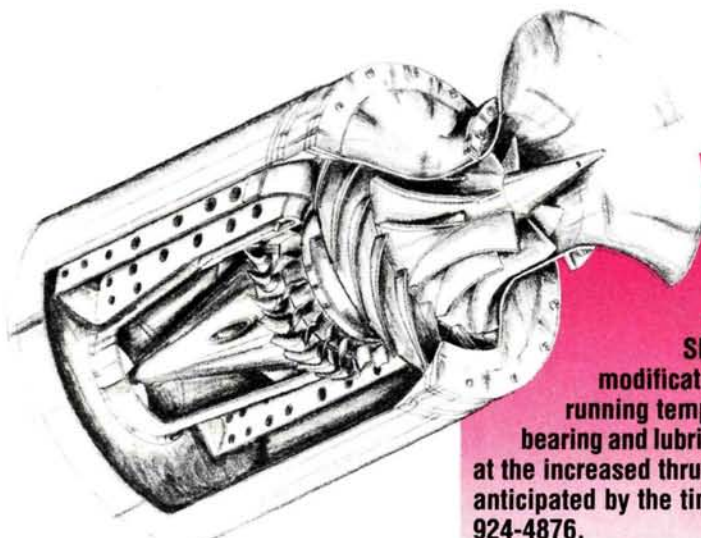
by CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!



GIANT TENNESSEE SCORPION

The high-quality, prefabricated, ready-to-cover line of Scorpio kits from Italy is now handled here by the smiling Martin men of Hobby Lobby International. This company always stands behind its product line, and it has a great reputation for solicitous customer service, so I'm sure the Scorpio kits will get the attention they deserve. The move to Brentwood, TN, comes with the introduction of the aerobatic monster pictured here—the Taurus Plus. This 12-pound, 7½-foot-wingspan giant is specifically designed for .80 2-strokes or 1.20 4-strokes, and it requires a 4- or 5-channel radio (optional flaps). Small-car owners needn't fear; the wing halves slide onto a 1-inch-diameter dihedral tube mounted in the fuselage. A full flight report will be forthcoming.



550+ MPH!

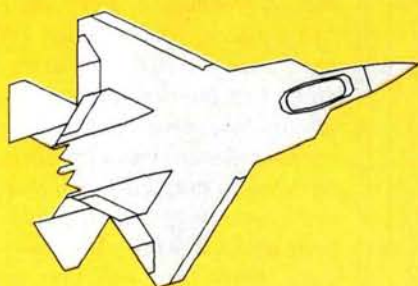
With its SR-30 Turbojet, Turbine Technologies Ltd., of Chetek, WI, claims 35 pounds of thrust and an exit velocity that exceeds 550mph and promises "new horizons for model aviation." The SR-30 incorporates an advanced diffuser and other modifications that result in higher engine pressure and lower running temperatures for improved performance. The engine's bearing and lubrication systems are reported to perform "flawlessly" at the increased thrust level. Delivery of the factory assembled units is anticipated by the time you read this. For more information, call (715) 924-4876.

JING
BOW!



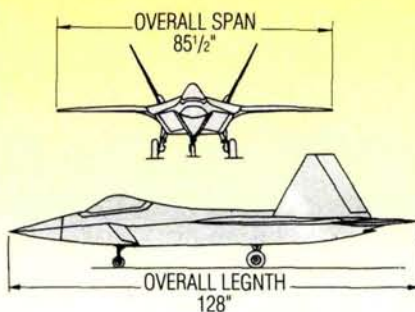
ARFs SPOTTED SOMEWHERE IN CHINA

Hobbico will be introducing a .60 2-stroke and a .90 4-stroke P-40E to its ASAP line of ready-to-fly kits. The Warhawk will have the same ply, spruce and balsa construction as the rest of the line. The kit will come with fixed gear, but a set of 90-degree rotating retracts will be available. Weighing between 6 pounds, 2 ounces and 6 pounds, 14 ounces (depending on the engine used), the Warhawk will have a 61-inch wingspan and a wing area of 605 square inches. As far as I know, this is the only P-40 available with ARF technology like that of the famous EZ line. Sources say that it's "the first in a series of legendary fighter aircraft from Hobbico." Those 90-degree retracts would look great folding into the wing of a Corsair or a Hellcat! JING BOW! TO YOU, TOO!



1/6-SCALE LOCKHEED YF-22A

Just in!—unconfirmed reports say this 1/6-scale YF-22A in final-test stages will be released in late spring. The twin-ducted-fan Lockheed has an 85 1/2-inch wingspan and a high degree of composite construction. This beautiful bird will be kitted by the best ducted-fan-kit manufacturer in the business—and we all know who that is! Stay tuned for details....



ASP 108



ASP 108ABC AREO

Recent rhetoric strongly suggests that the extensive, good-running, affordable ASP line will soon be joined by an ABC 108. If this rumor is true, I'm sure World Engines will be the importer.

This unconventional, .5-ounce muffler, which is manufactured by the Field-Saver 90 people of Atkinson, NH, uses circular wave-guide-cancellation technology. As sound travels through a "pipe" or "wave guide," standing waves and phase shifting can occur. An organ pipe amplifies sound, and the Field-Saver 90 is designed to suppress sound naturally by using phase cancellation. The manufacturer claims a 10dB (± 2) reduction with this muffler. "This technology has been used by the military in various applications." If the "below 90dB" and "no power loss" claims are true, both our engines and our neighbors will be much cooler!



BEYOND
90dB

Give yourself or a friend the R/C modeling gift that lasts all year long!

MODEL AIRPLANE NEWS



12 GIFTS IN ONE!

1. Substantial Savings!
2. In-Depth Product Reviews!
3. Informative Articles!
4. Best Event Coverage!
5. Sizzling Photography!
6. High-Tech How-To!
7. Reader Participation!
8. Best Construction Articles!
9. Design Contests!
10. Advanced Electrics!
11. Incredible Helis!
12. Money-Back Guarantee!

Subscribe now! Complete and return the attached order card, or call toll-free: **1-800-435-0715**



AIRWAVES

(Continued from page 13)

used to fly my trainer. Do you agree?

ROMMEL CARRILLO
Los Angeles, CA

Rommel, it's always nice to hear from a young modeler involved in R/C, and I hope you're enjoying your new hobby. A schoolyard, however, is no place to fly this type of plane; racers are fast and need a lot of air space for safe operation. I strongly suggest that you join a local club and fly with them at their field.

If your second plane is a high-performance Formula-1 pylon racer, you've bitten off more than you can chew at this point. I recommend that you fly one or two more intermediate trainers (faster ships with ailerons and no dihedral), and then work your way into the mid-wing and low-wing plane category. Only then will you be approaching the level of skill needed to pilot a high-performance pylon racer. Again, go to your local club and find out who is flying pylon racers. I'm sure that they will help you. TA

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

GIANT STEPS

by DICK PHILLIPS

Tips For Building Big

IT'S WINTER, AND those of us who live in the "snow belt" have stored our models for the season and are busy working at the building board. Of course, we stored our models after we had inspected and repaired them, and we routinely cycle (charge) our radio batteries throughout the winter. Such preparations ensure that we'll be ready to fly as soon as spring arrives.

AT THE BUILDING BOARD

When the chores are done, we want to get to the building board quickly and start work on that new kit, or those new

plans. If you build from a kit, most of the material is supplied, and it's a relatively simple matter to follow the instructions and build the model. If you're starting a plans-built model, however, you need to make some preparations first.

There are two schools of thought on building from plans: one group makes all the necessary parts before they begin construction (in effect, creating a kit from which to build); and the other makes the parts as they're needed during construction. If you make all the parts first, you won't see much progress until you've completed and started to assemble them. If you make the necessary pieces as you go, the model will take shape much more quickly, but you'll have to stop construction periodically to make parts for the

next steps. It doesn't make any difference which method you use (both have their good and bad aspects); you'll complete the model in about the same time—so suit yourself!

Be sure to mark all the patterns and parts as you make them. There's nothing worse than having to stop and scratch your head (while you're in the middle of construction) to figure out what a particular part is for, or to find a missing piece. It only takes a second to mark the pieces with a fine-tip felt pen.

SUBSTITUTE MATERIALS

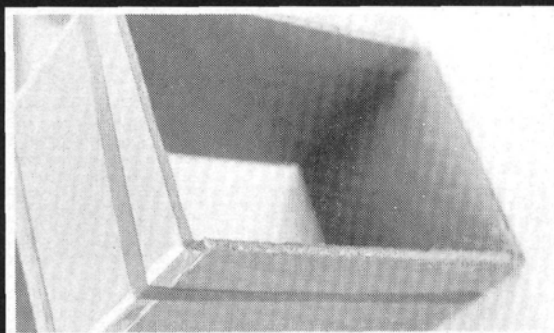
Several materials can be substituted for conventional (and expensive) modeling products, and I'll describe some of those that I've used successfully. Naturally, to build large

models, you'll need more material, and using cheaper substitutes can reduce the overall cost. Some of these materials are actually more suitable for model building than conventional ones! Craft shops, sign shops and their suppliers are often good sources.

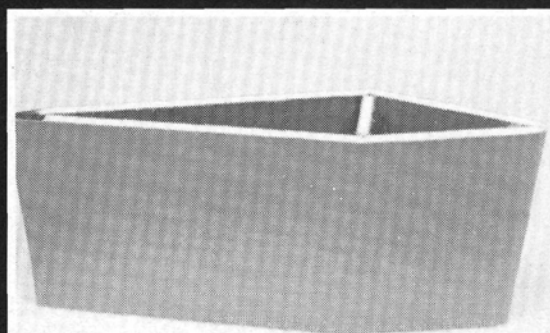
FOAM CORE

Although this material is called many things, its structure is the same, regardless of its name. It usually consists of a layer of Styrofoam covered (on one or both sides) with either card-stock or craft paper. The coating paper varies in quality and type, and the foam comes in several thicknesses. You can easily work with foam core using the usual model-building tools and glues.

Foam core is an ideal material for parts that don't bear any significant load



1. Here's a foam-core fuselage section. Note the wood strips at each corner. The wood has a better gluing surface than the foam.



2. This wing section is of foam core that's scored on the inside where bends are needed. The foam-core spar is tack-glued into place with epoxy. The trailing edge is folded over the opposite surface and also glued into place. The form has been removed at the trailing edge.

and those that are used for shaping. (Wing ribs, formers, etc., are good candidates.) They'll weigh about the same as parts made of other materials typically used—sometimes even less! You can easily cut most types of foam core with a hobby knife, and you can sand it slightly, too, although its paper coating tends to fray if you sand too heavily.

In general, the finer the foam's texture, the better the foam core is for model building. (Note: the fine-textured foam is heaviest.) You should test the glue you intend to use on a sample of the foam core to see whether they're compatible. In most cases, the usual finishes work well, but check your favorite for compatibility. Also, most water-based paints work quite well on foam core, so you should be able to use almost any color.

Several people have successfully built entire models out of foam core. It works well for non-scale giants that can be "whipped up" quickly. They can be

"dressed up" to look like specific airplanes, even if they're stand-off (a long way off) scale!

MAHOGANY DOOR SKINS

Light mahogany plywood (door skin) is available at most building supply stores. It's approximately $\frac{1}{8}$ inch thick and is usually of good quality. In large models (many of which are grossly overpowered) the slight weight increase isn't significant. You can use door skins to build formers, wing ribs and other light-load parts, and they're inexpensive; a few dollars buys enough wood to build a lot of airplane!

OTHER PLYWOODS

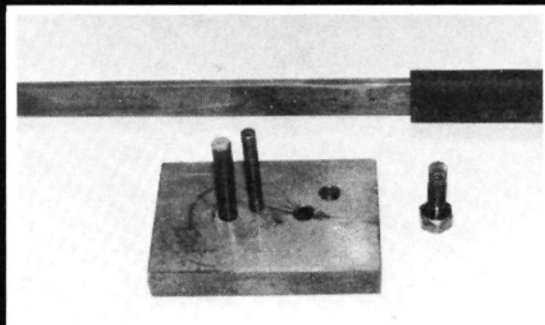
If you have access to a good cabinet shop, talk to the people there about their "offcuts" (the waste material that's left after they cut the wood that they intend to use). Often, offcuts are large enough for you to use, and the quality of the wood is very good. The plywood used in

such shops comes in a variety of sizes, and the owners often happy to see the offcuts hauled away.

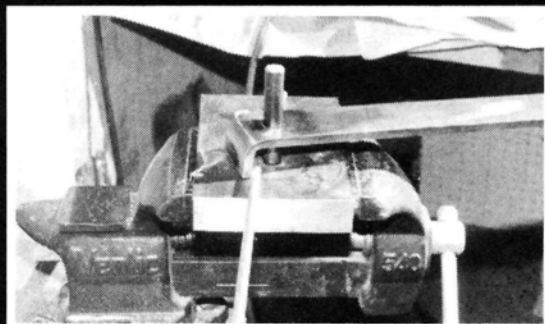
Marine plywood, which is usually made of a soft

wood, is also a good model-building material. I use it for firewalls and load-bearing parts such as landing-gear mounting blocks.

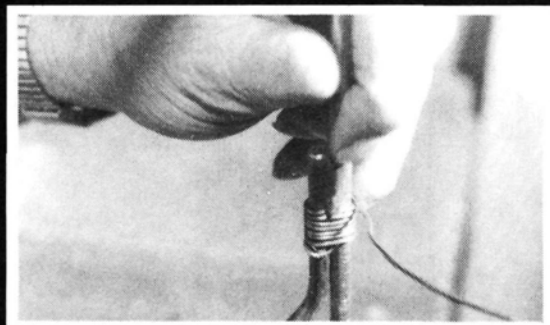
(Continued on page 124)



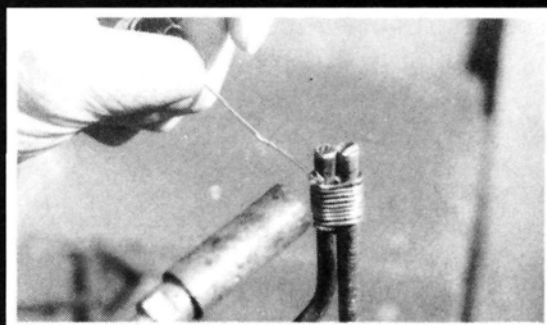
3. You need a good wire bender for giant-scale landing-gear wire (as well as a strong right arm!).



4. To bend $\frac{1}{4}$ -inch wire, clamp the bender in a strong vise. The corner of the bending arm (where it contacts the wire) is relieved and case-hardened.



5. A small square punch is used to tighten the baling wire on a landing-gear joint. Vice-grip pliers are used to keep it tightly wrapped.

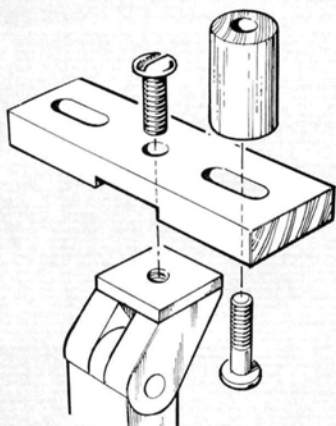


6. Hard solder (higher-than-normal temperature) is used to bond the wrapping wire and the gear wire together. To significantly increase the joint's strength, use this method instead of wrapping it with light copper wire and soldering it with normal solder.

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH. PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

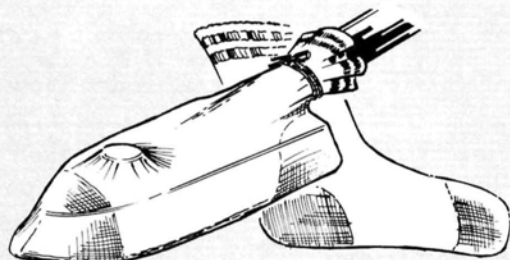
by JIM NEWMAN



TRIPOD "THIRD HAND"

A camera tripod can be adapted to hold a wing or a fuselage at a convenient angle for assembly. If you put the tripod into a large garbage bag first, you can also use it while spray-painting; the large, drilled, dowel stand-offs keep the part clear of the tripod and allow unhindered coverage. Note the large, wooden-block adapter, which is slotted for wing or fuselage mounting bolts.

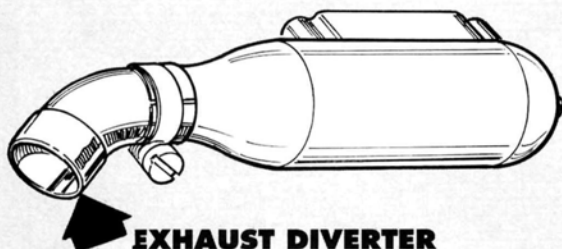
Bob Labrash, Roseville, MN



MONOKOTE IRON SOCK

Here's an inexpensive way to prevent unsightly scratches on your covering film. Simply slip a cotton baby sock over the sole of the iron!

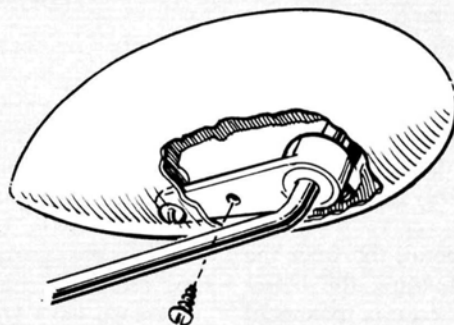
Michael Saponara, Flushing, NY



EXHAUST DIVERTER

You can make this exhaust diverter using a copper elbow from the plumbing department of your local hardware store. Slit the elbow as shown, slip it over the end of the muffler, and then clamp it with a small hose clamp. If you dislike the elbow's copper color, coat it thinly with wipe-on solder.

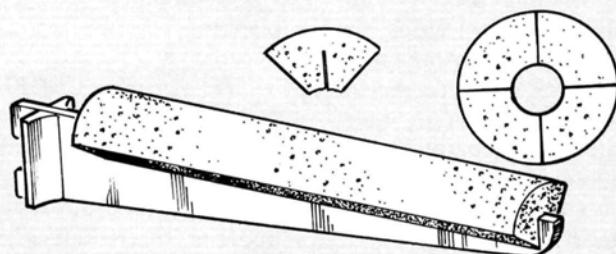
William Lund, Iola, WI



WHEEL-PANT MOUNT

To hold a wheel pant firmly in place, yet still allow some flexibility, clamp a nose-gear steering arm to the part of the axle that's inside, and screw a couple of sheet-metal or wood screws through the pant and into the steering arm.

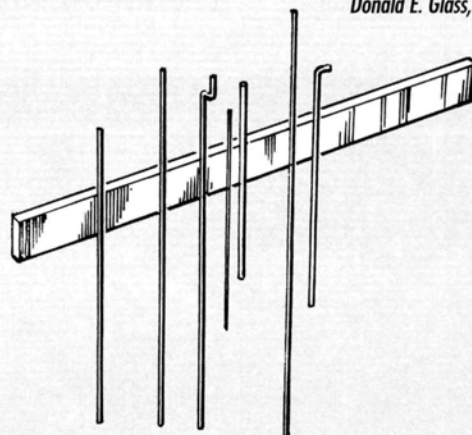
Bob Smyth, Cincinnati, OH



WING-RACK CUSHIONS

Some people use regular shelf brackets in their wing racks, but the metal strips can leave marks on the wings. The solution?—cut a piece of foam pipe insulation (\$2.39 for 6 feet) into four pieces, then slit each one, and glue them over the edge of the bracket. (A wavy-edge bread knife cuts foam cleanly.)

Donald E. Glass, Fair Oaks, CA



MUSIC-WIRE STORAGE

Do you always throw away short lengths of music wire, and then later find you could use them?! Store them conveniently on a magnetic strip that's secured to the edge of a shelf.

Silas Seandel, New York, NY

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOT\$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together, plus a brief description and send it in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

NINE TIGERS LIVE!

This twin, O.S. .40 FP-powered floatplane version of the Carl Goldberg Sky Tiger is the work of Lon Haney, of Belton, MO. He enlarged the plane's fin and rudder to aid yaw stability, and it weighs 6½ pounds (with floats). Lon must really love those Sky Tigers because he has built nine of them, and it takes him only 31 hours to finish one!



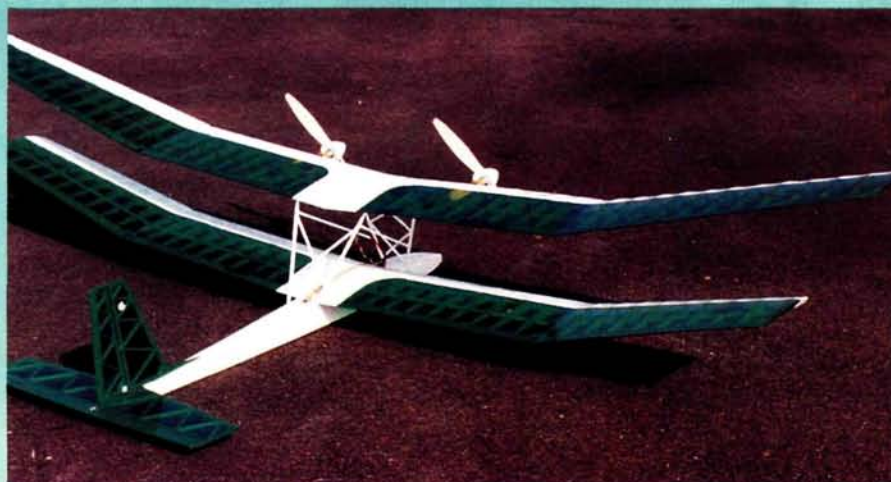
D-DAY IN NORWAY?

Lars Erik Armtsen of Mosjoen, Norway, built this Spitfire MK 1X from a Marutaka kit. Its wingspan is 64½ inches and it weighs 9 pounds. This little devil is powered by a Super Tigre .75 S and guided with a German multiplex radio that's complete with retract control and flap control. The finish is dope and super-finish polyurethane paint (applied with an airbrush). The camouflage scheme is standard RAF "A" with D-Day invasion stripes. This is Lars' eighth model!

PRESIDENTIAL CHOPPER

Here's Mark Ewert's (College Place, WA) Bell 222B, which uses GMP Cobra mechanics and is powered by an O.S. .61 rear-exhaust engine. It also has a McDaniel's on-board glow driver, a complete lighting system and Carl Goldberg retracts. Judging from the hover, we'd say Mark is a steady heli pilot. The fact that he has won 1st and 2nd places in scale competitions also confirms his building ability. Mark is president of the Southeastern Washington Helicopter Association.





TWO-WING GENTLE LADY

Bob Ortman of Campbell, CA, built this very unusual two-wing conversion, twin-engine Gentle Lady. It's powered by two FAI 05s turning 13x7 props. Its upper wingspan measures 89½ inches and the lower one is 77 inches for a total wing area of 1,428 square inches. It weighs 5 pounds, 14 ounces, and Bob says it can climb almost vertically. Bob added landing gear and has no problem at all ROG-ing. This plane is definitely an "attention getter"!

JAMMIN' JUNKERS

This tri-motor Junkers JU-52 was submitted by James Ferrell of Flint, TX. Jim powers this beauty with three, Saito 45, 4-stroke engines (each has its own fuel tank and throttle control). Its wingspan is 105 inches, and it weighs 15 pounds. The nose section of the fuselage and the two wing nacelles are aluminum-clad. The Junkers' cruising speed is at two-thirds throttle (the outboard engines are held slightly over idle at cruise), and it makes a wondrous sound when it flies!



CORSAIR À LA CARRIER?

Roger Baker's Byron's Originals Corsair is shown on the deck of the U.S.S. Yorktown aircraft carrier in Charleston, SC. With a Q .50 engine for power and Robart 90-degree rotating retracts, Roger says it flies better than any other scale model he has ever built! He couldn't have chosen a better backdrop for a Navy Vought F4U Corsair!



*This R/C rubber -powered
thermal hunter offers "classic"
flying pleasure*



The author winds the rubber motor before a flight—this is hard work!

RUBBER GUPPY

b y J O H N V A L L S

SPECIFICATIONS

Type: Rubber-powered R/C
Wingspan: 52 inches
Weight: 1 pound, 7.8 ounces (23.84 ounces)
Wing Area: 364 square inches
Wing Loading: 9.43 ounces/square foot
Power Req'd: $3/16$ -inch Brown FAI* rubber; 18 loops (36 strands), each 40 inches long.
No. of Channels Req'd: 2 (rudder and elevator)

FLYING RUBBER-POWERED model airplanes has always been my favorite form of rec-

reation. When I started building models, they were the only kind of

The author displays two Rubber Guppies.

model airplanes you could build! I remember waiting impatiently for the latest issues of model magazines;

maybe there would be a full-size plan that I could try to build from.

As I got older, the distances I had to go to retrieve my model seemed to lengthen, so I came up with the idea of rubber-powered R/C modeling. Flying is, of course, the most enjoyable

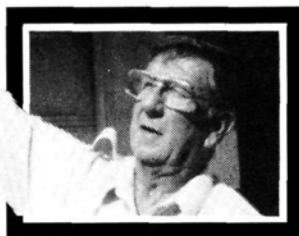
part of the hobby, and I had the right time and weather to fly the Rubber Guppy during the Laredo Air Races on October 13 and 14. Run by the R/C Modelers of Laredo, TX, this annual pylon race was held at the old Air Force base, where thermals are generated by



PHOTOS BY JOHN VALLS

RUBBER GUPPY

Below, from top to bottom: ■ Propeller profile is drawn on a block of medium-hard balsa. ■ The profile is cut out with a band saw and whittled to shape with a sharp knife. ■ Propeller assembly; top—carved propeller and $\frac{1}{32}$ -inch steel-wire prop shaft; middle, from left to right—heavy-duty polyester thread; hinge pins made by bending a strong paper clip; tin sheet for the front and rear prop-hub plates; hard-balsa nose block; break screw; bobbin; metal nose bearing and ball-point-pen tension spring. ■ The shaft is checked for alignment before the plates are glued to the hub. ■ The completed prop assembly; note the rubber band that holds the prop either extended or folded.



The airframe before covering, concrete aprons and the aluminum roofing of the numerous hangars.

down-elevator to avoid a stall and preserve altitude. It slid right into a thermal and, gaining another 100 to 200 feet, seemed to shrink even further in size. After a ride of about 4 to 5 minutes, it slipped out of

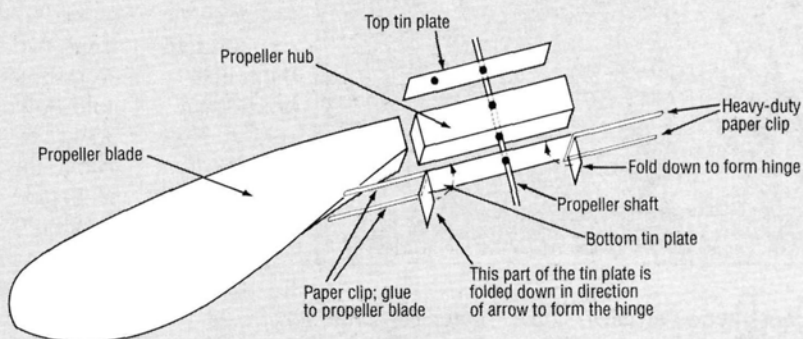
Goldberg Gentle Lady and can be brought back to the launching site—a quality that's now very important to me!

THE RUBBER GUPPY

The Guppy is simply a

PROPELLER HUB AND BLADE

Exploded view



After the races, at approximately 2:30 p.m., we flew the plane four times. With a motor wind of 98 turns using a Simplex* Sidewinder (which turns the motor 3.5 times for every wind), its longest flight lasted 13 minutes, 47 seconds. The altitude achieved on the motor run seemed to be more than 400 feet. It had an amazing climb of approximately 70 degrees for the first 20 seconds, during which the motor was at optimum strength. It then leveled to about 60 degrees for the next 12 seconds and, after about 5 more seconds, the prop folded, and it made the transition from climb to glide, with some

the thermal, only to catch another. Its second flight lasted 10 minutes, and I suspect that, on a really hot day, we could achieve a far longer flight!

Gil Horstman, the AMA Associate VP for Central and South Texas, watched and timed the flights, and he had this to say: "The model was very impressive—the first R/C rubber-powered aircraft I've seen. Its performance is on a par with nearly any of the pure contest rubber ships seen in competitions. My feeling was that flights would have been longer if airspace hadn't been restricted and prevented it from chasing after thermals!"

The Rubber Guppy flies more slowly than the

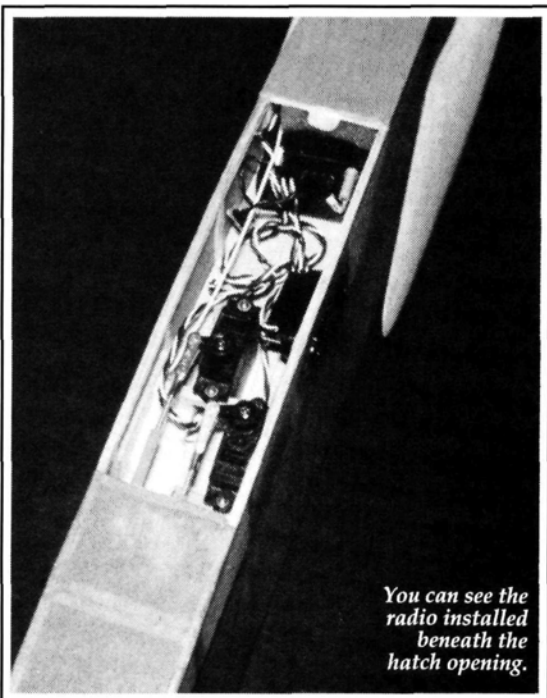
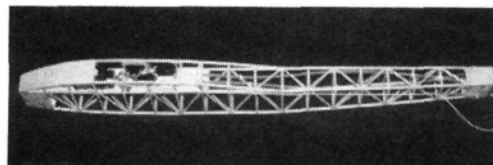
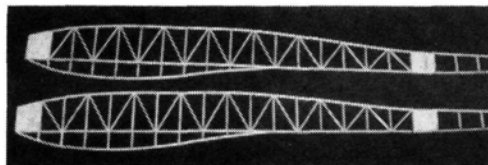
stick model with a pouch far forward under the fuselage to house the radio gear. The front moment arm is a little longer than usual to enable it to fit the radio battery, the receiver and the servos. This pouch makes it look like a guppy, so instead of "Rubber Ducky," it's a Rubber Guppy—clever, yes?!

The wing airfoil section is a modified Lanzo, which, in turn, is a modified Grant X. This is needed to help carry the extra weight of the radio gear. Everything else on the model is of a conventional design for a rubber-powered airplane.

My friend Walt Mitchell, who has written quite a

RUBBER GUPPY

■ Left: The completed fuselage sides with sheeted front and rear stations. The rear sheeting holds the rubber hold-down dowel. ■ Right: The radio gear is mounted in the "guppy pouch."



You can see the radio installed beneath the hatch opening.

few construction articles, said, "To scratch-build is one thing; to tell someone how to scratch-build is another thing." Truer words were never spoken! Please bear in mind that, if you scratch-build, your techniques may be better for you than the ones I describe.

CONSTRUCTION: THE FUSELAGE

Select four, hard, $1/8 \times 48$ -inch square balsa sticks for the longerons. Cover the plan with plastic wrap to protect it from CA. Lay out the top and bottom longerons and fill in the uprights—also from $1/8$ -inch square, medium-hard balsa. Lay out the pouch longeron and fill in the uprights for the pouch.

When the CA has set, lift the front end off the plan, trace the sheet-balsa-filled front end onto $1/8$ -inch sheet balsa, and cut and install it between the first and second sta-

tions. Do the same for the rear station where the rubber hold-down dowel will go.

Now you can install the fuselage cross-braces, which are set diagonally between every station up to the rubber hold-down station. Note that the diagonal cross-braces on one fuselage side are

reversed on the other side. The reason for this is to create triangles along the top and bottom of the fuselage after the fuselage sides have been joined and the cross-braces installed between all stations.

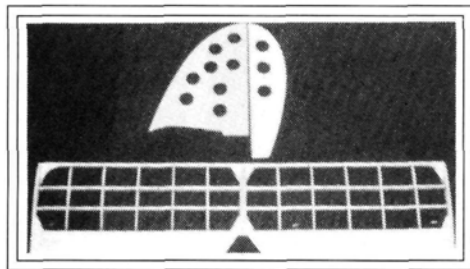
Cut the top, bottom and side diagonal cross-braces of

To join the two fuselage sides, put them upside-down on the plan, then block up one using a 90-degree triangle to true it. Add the center-section cross-braces to the top and bottom first. The top center-section cross-braces are cut from $1/8$ -inch sheet balsa because they have to be notched with a vee to take the center-section dihedral angle of the wing.

While the fuselage is still pinned to the plan, add the front, two, top and bottom cross-braces and the rubber hold-down-section cross-braces, making sure they're true to the plan. You can use 90-degree angles to check for fidelity. Remove the fuselage from the plan, and add the top and bottom cross-braces and the diagonal braces.

RUBBER HOLD-DOWN DOWEL

Fill in the fuselage top and bottom front section and the top and bottom dowel hold-down section with $1/8$ -inch sheet balsa. Measure where



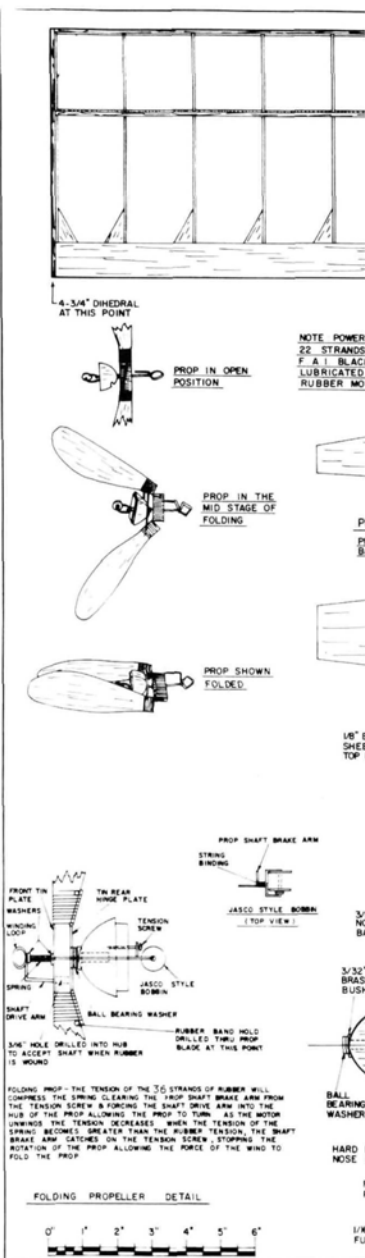
The lightly built tail feathers.

$1/16 \times 1/8$ -inch medium-hard balsa. The triangles increase fuselage strength significantly. Remember that the fuselage will have to endure more stress than a regular free-flight rubber job because of its greater weight and wing area. You'll need a little more rubber to power this model.

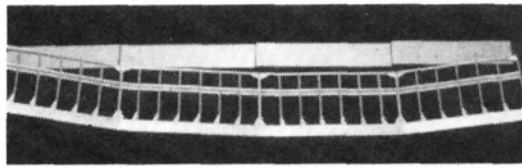
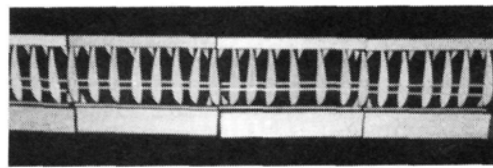
the dowel hole will go, and drill with a $1/4$ -inch drill bit. Cut two 1-inch-square pieces of $1/8$ -inch sheet balsa, drill a $1/4$ -inch hole in the center of each, and install them cross-grain on the inside of each fuselage side at the rubber hold-down stations.

Sand the fuselage sides and

top lightly with medium-grit sandpaper. For this, I use blocks of $1 1/2 \times 3/4 \times 14$ -inch pine to which I've epoxied sandpaper of various grits. When sanding the fuselage sides and top, sand lightly with the block at an angle to the cross-braces. Now install the $1/16$ -inch sheet-balsa roof on the bottom of the fuselage box (which will be the top of



■ Left: Parts for the wing laid out before assembly; gussets support the under-cambered wing. ■ Right: The assembled ribs and spars; next comes the leading-edge top sheeting.



the "guppy pouch" on the front part of the fuselage). This will be easy, because you haven't yet added the cross-braces to the bottom of the pouch.

The roof goes from station 2 to station 7, and it protects the radio gear from the lubricant that the rubber will fling out as it unwinds. Cover the bottom front of the

pouch with 1/16-inch sheet balsa from the front to station 3. Stations 3 to 6 are covered by a removable hatch cover of 1/16-inch sheet balsa. It's anchored at the rear and held by one small screw at the front.

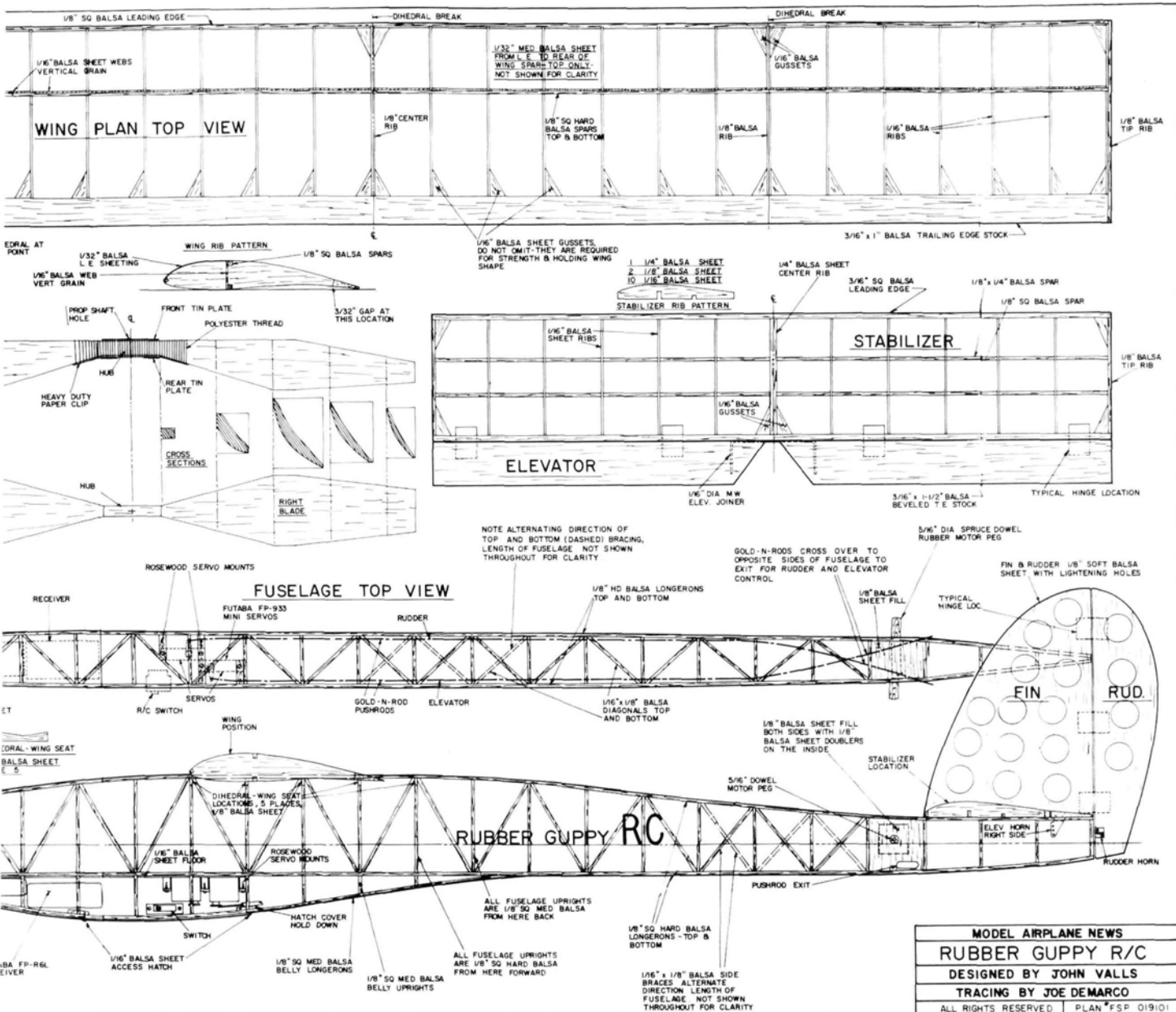
THE WING

You must trace the outline of the wing airfoil from the plan

#FSP01911
RUBBER GUPPY
\$12.00



This unusual, proven design provides the thrill of launching a high-performance, thermal-hunting, rubber-powered ship with the assurance of a safe return. Powered launches—with an initial climb angle of approximately 80 degrees—pull the Guppy up several hundred feet. The airframe requires intermediate building skills; miniservos are used in the plan; propeller assembly will be helped by referring to the illustrations in the construction article (1/91). One full-size sheet. WS: 52"; L: 42"; Power: 3/16-inch Brown FAI rubber (18, 40-inch-long loops); 2 channels. LD: 2.



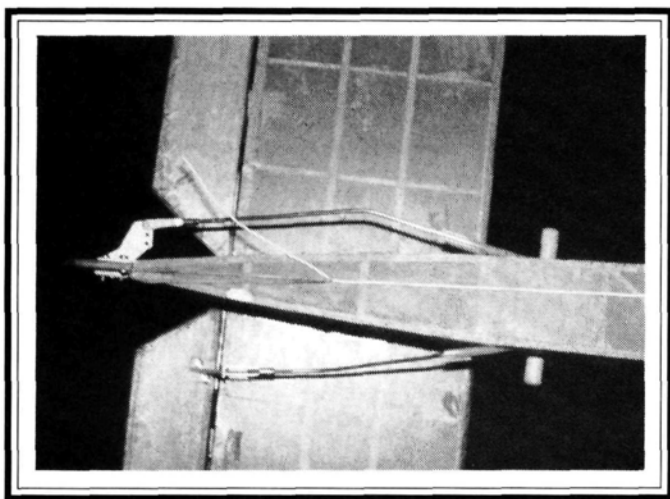
ORDER THE FULL-SIZE PLAN... page 120

RUBBER GUPPY

to cut out the required 27 ribs. I use See-Temp* to make my rib patterns. It's a special soft mix of vinyl that's calendered on both sides. You just put it onto the rib pattern shown on the plan, score it with a modeling knife or razor blade, and then break out your template following the scored line.

I traced three ribs on a 1/16-

1/16-inch sheet balsa following the plan. Shaped like right triangles, the gussets must measure 1x1/2 inch, with the long side facing the rib. The gussets are necessary because this airfoil section calls for a blocked-up trailing edge to form the under-cambered shape. The gussets increase the strength of the rear of the



The control linkages to the elevator and the rudder.

inch sheet of balsa, leaving ample room on the top, bottom and sides. I then cut as many planks as were required to make the 27 ribs, stacked them and put two thin pins through the front and rear of each rib. Be sure to countersink the pinheads under the plans so that you'll have a smooth surface when you cut them out with a jigsaw or a band saw.

The top and bottom spars are of 1/8-inch-square hard balsa, and the leading edge is also of 1/8-inch hard balsa. The trailing edge is 3/16x1-inch trailing-edge tapered stock. When attaching the ribs to the trailing edge, you must block up the forward edge of the trailing edge by 3/32 inch. You'll have to cut about 40 triangular gussets out of

wing where the ribs join the trailing edge.

BUILDING-IN POLYHEDRAL

The wing is made in sections, starting with the center panels. Remember that the center and polyhedral break ribs are cut from 3/16-inch balsa. The rib thickness at these joints provides a strong anchor for the 1/8-inch spars. Make the right inner panel first. Then lift the right end off the plan, blocking up 2 inches at the outer rib. Build the left inner panel onto the blocked right inner panel. Remove the joined center panels, and set the right outer tip of the right inner panel onto the building board.

Now block up the center panel 12 inches in from where the outer panel will be joined

to it, i.e., at the second rib from the center of the wing. Then build the outer panel onto the inner right panel, and repeat the process for the left outer panel. This will give you the required 4 3/4-inch dihedral at each tip.

As you build each panel, you have to add the shear web out to the end of the wing, flush with the fronts of the top and bottom spars. Cut the shear web out of 1/16-inch sheet balsa with the grain running vertically. Now add the 1/32-inch, sheet-balsa, leading-edge-to-spar covering. This sheeting extends onto the leading edge. To ensure that you have a flat surface on which to glue the sheeting, you'll have to sand the leading edge where it meets the rib.

First install balsa leading-edge sheeting on the two center section panels, and then install the balsa leading-edge sheeting on the outer panels. Face the end rib with 1/8-inch sheet balsa (as a doubler) and sand it to form a sturdy wing tip.

STABILIZER & RUDDER

Construct the stabilizer ribs in the same way as the wing ribs. Cut a pattern of the stabilizer airfoil section out of See-Temp, and draw several ribs on 1/18-inch sheet balsa, leaving ample room on the top, the bottom and the sides. Cut as many planks as you need for the ribs (13). Remember that the center and tip ribs are cut out of 1/14-inch sheet balsa.

The stabilizer leading and trailing edges are of 3/16-inch-square balsa; the front spar is of 1/4x1/8-inch hard balsa; and the rear spar is of 1/8-inch-square hard balsa. Cut the elevator out of 3/16-inch sheet balsa. The left and right elevator halves are joined by a piece of 1/16-inch steel wire

that's epoxied into the elevator halves as shown on the plan.

Cut the rudder out of soft, 1/8-inch, sheet balsa. To minimize weight, drill holes. (This is important this far back from the center of gravity.)

PROPELLER & NOSE BLOCK

Cut the propeller out of a block of 20x2 1/2x1 3/4-inch medium-hard balsa. Draw the top profile and the side profile, and cut them out using a band saw. You'll have to redraw some of the profile lines because, as you cut the top or the side, you'll have to cut out the other top or side lines. Use a sharp knife to whittle your propeller into shape, then sand it to its final form.

Cut the front and rear plates out of tin sheet—a large tin-can top will do. Bend the shaft out of 3/32-inch steel wire as shown on the plans and in the photographs. Use a heavy-duty paper clip to make the hinges. Bind the front and rear plates with heavy-duty polyester thread, but don't glue them yet. Ensure that the inserted propeller is at a right angle to the shaft, and then glue the thread and plates to the center hub section. Now you have to shape the hinge ends so that they lie flat on the blade's surface and bind and glue.

Balance the propeller by sanding across the top of the airfoil near the tip, then apply five or six coats of dope, and balance it again by adding dope to one side or the other as needed.

Cut the nose block out of hard balsa, sand it to shape, and drill the shaft hole. Drill the front to take either a metal or a wooden nose bearing. (Nose bearings can be obtained from Ken Sykora's Oldtimer Model Supply*.)



Cut the rectangular backplate for the nose block out of $\frac{3}{16}$ -inch hard balsa, and install it so that the nose block will fit snugly on the fuselage's front end. Plug the backplate into the fuselage first, then use CA to glue the nose block to it, firmly pressing on the backplate from inside the fuselage.

Use a ball-point-pen spring as a tension spring in front of the propeller. You can use a bobbin from Oldtimer Model Supply to hold the rubber-band loops together, or you can simply slip rubber tubing over the shaft wire that's bent to anchor the rubber motor.

COVERING

Oldtimer also provided the heavy-duty "Japanese" tissue used on the fuselage and the "Kyosho" tissue used on the wing, rudder and stabilizer. Use Devcon's* Duco cement to attach the tissue. (Many prefer to cover with dope, but it's best to use Duco when covering with a heavier tissue.) You'll have to wait for the cement to set before you can trim away the excess tissue from the fuselage side, or it will come right off. (It's stronger and takes less dope than American silkspan.) I also use Duco cement because the wing has a pronounced under-camber, and every rib has to be anchored on the bottom.

RADIO GEAR

I use Futaba* miniservos, a standard Futaba receiver and a Futaba NR-4G 250mAh power pack, which weighs about half of a regular receiver power pack. Install the servos on hardwood $\frac{3}{8} \times \frac{1}{4}$ -inch runners, as shown on the plan. Install Sullivan* Golden-N-Rods along the bottom of the fuselage so that they exit at the bottom of the

rubber hold-down station. Brace the Golden-N-Rods every few inches by holding them to the fuselage uprights or cross-braces with thread and CA. Put the battery as far forward as possible in the "guppy" pouch. The fuselage is wide enough to take the standard Futaba receiver lengthwise.

THE FUTURE OF RUBBER-POWERED R/C

I envision a contest for rubber-powered R/C models: fliers would have six attempts to make three official flights, and the best of the three would be the winner. Max flight would be 30 minutes, and all those who "maxed" would take part in a fly-off. Any takers?

**Here are the addresses of the companies mentioned in this article:*
FAI Model Supply, 344C East Carson St., Carson, CA 90745 (mentioned in specifications chart).
Simplex; distributed by Ken Sykora's Oldtimer Model Supply, P.O. Box 7334, Van Nuys, CA 91409.
See-Temp, P.O. Box 105, Sussex, WI 53089.
Oldtimer Model Supply (see above).
Devcon Corp., Wood Dale, IL 60191.
Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.
Sullivan Products, 1 North Haven St. Baltimore, MD 21224 ■



SEVEN HOURS ON RUBBER POWER!

by TOM ATWOOD

Over the years, John Valls has built uncounted rubber-powered models—both kits and "home grown"—and entered innumerable contests. His flying achievements include a world-class duration flight, which he made in the summer of '48 in Waco, TX. His model was a scratch-built Wakefield design with twin rudders, box fuselage and cabin (the blurred image in the photo). The model used a 14x20 prop, and its wing area was 200 square inches. At a local meet, in the presence of Ken Sykora (noted vintage rubber-power modeler), John launched the plane at 10:30 a.m. and was elated to see it caught by a thermal. It flew up and out of sight in 10 minutes, so John won the contest but lost his model—at least, temporarily!

Hours later, the plane was spotted coming down on a farm 20 miles away. The farmer thought it was a buzzard after his chickens, so he went to get his gun. John's name and address were on the model, and when the farmer returned it two weeks later, he reported that he was just going out to his cows when he spotted the plane at exactly 5:30 p.m.—an elapsed flight time of 7 hours!



SPECIFICATIONS

Type: Aerobatic sport electric
Wingspan: 41 inches
Weight: 42 to 44 ounces (ready-to-fly)
Area: 374 square inches
Wing Loading: 16.1 to 16.9 ounces per square foot
Power Req'd.: HP-100 Mabuchi; 7.2 or 8.4V 1200mAh, or 8.4V 900mAh battery
No. of Channels Req'd.: 4 (rudder, elevator, aileron, speed controller)
Sug. Retail: \$114.95

REVIEW MODEL

Weight: with 7-cell 900mAh—40.5 ounces; 7-cell 1200mAh—42.5 ounces.

Wing Loading: with 7-cell 900mAh—15.3 ounces per square foot; 7-cell 1200mAh—16.3 ounces per square foot.

Radio: Airtronics Vanguard 4 FM with four no. 401 miniservos and an MA3 speed controller with BEC and voltage regulator.

Features: hot-wound Mabuchi HP-100; Tornado 7x6 nylon prop; aluminum prop adapter; and includes all the hardware you'll need. Excellent die-cutting, spinner, foam tires and assembly manual.

Comments: the Electric Hots is an all-around aerobatic sport plane that will fly the pants off most kitted electrics.

M I D W E S T electric HOTS



PHOTOS BY JOHN LUPPERGER

by JOHN LUPPERGER

Power pilots take note—a full-blown, sport, aerobatic, electric airplane has arrived!

THE ELECTRIC HOTS is another advancement for electric flight—a kit of a full-blown, sport, aerobatic, electric plane. Although electrics have proven themselves good for a variety of applications (sailplanes, old-timers, trainers, pylon racing—even scale), until now—at least, in my opinion—there hasn't really been a good all-around sport model that would draw power pilots into the fold. Midwest* has made its popular Hots design even better—they made it *quiet*! The Electric Hots isn't a converted glider and will, I'm sure, be readily accepted as a power model by the "wet"-fuel fraternity.

THE KIT

The kit arrived in good condition, with the wooden parts grouped and sealed in plastic bags. The die-cutting was quite good, and the parts were easily removed from their sheets. The wood was of good quality: light, but strong enough for the intended task.

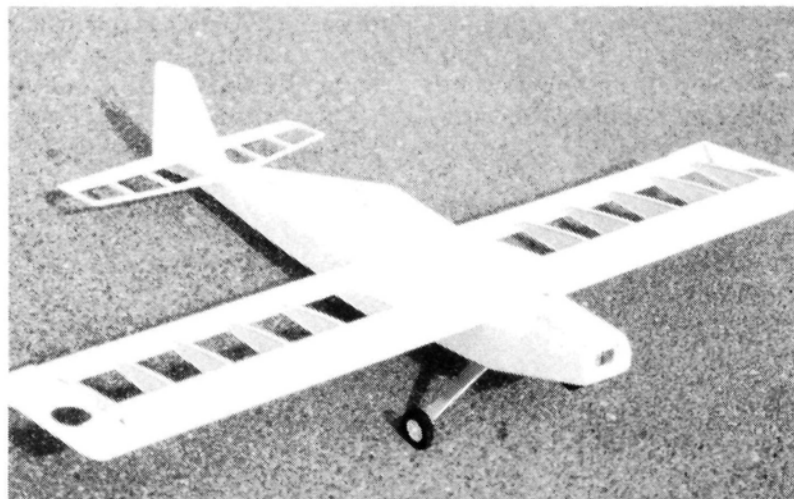
The motor is a Midwest HP-100 (Mabuchi can type) with a slightly hotter wind than that supplied in most kits. An aluminum prop adapter and 7 x 6 Tornado nylon prop are included, as is all the hardware you'll need: all control hookups, spinner, landing gear, Velcro®, wheels and light foam tires. A Mylar transfer sheet helps you to give your completed Hots a finished look.

The single-sheet plans are easy to read, and the locations of the electric and radio gear are clearly shown, so installation is easy. The instruction book is one of Midwest's Success Series, and it must be seen to be believed. Containing 64 pages and more than 175 line drawings, it covers building, electric- and radio-gear installation, finishing and flying. If you can't build the Hots correctly following these instructions, you should take up another hobby!

CONSTRUCTION

Construction is conventional, but slightly different! No; that isn't a contradiction! The Hots has the usual built-up construction, but its unusual fuselage shape requires a little extra care. The construction book is so detailed that I needn't go into details here. The building instructions are some of the best (if not *the* best!) you'll ever find in a kit. Follow them, and you'll have straight, true model that will fly extremely well.

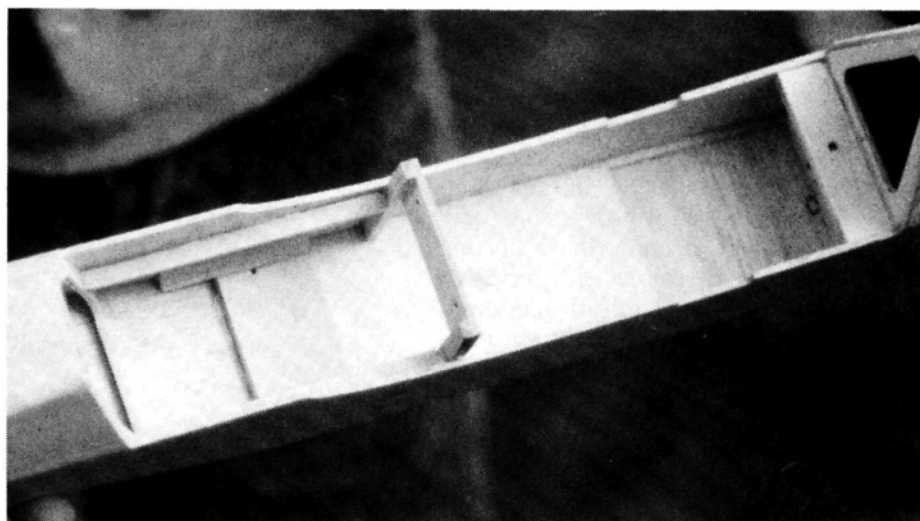
The wing is a typical D-tube structure with capstrips. Its only unusual features are that it's attached to the fuselage with three 4-40 Allen bolts, and the ailerons are hooked up with pushrods to horns, rather than being the more conventional "strip" aileron style.



This bare-bones shot should make "power" fliers feel completely at home, because the model looks like a typical "gasser."

My only real complaint about the kit arose when I was building the wing. As we all know, weight is electric's number-one enemy. Most of the wood in the kit is light and of a good quality, but the wing sheeting was *so* light that, when sanding it, I put a finger through mine—twice! If you buy a kit with wood that's this soft, either re-

selage, you have to use the wing to set up the "three-bolt" bulkhead and the rear-wing hold-down. Then frame the upper half of the fuselage, and cut the cockpit hatch free. The slide-type, spring-loaded cockpit latch is the type often used in large-scale gliders. A nice feature, it holds the cockpit securely in place but allows easy access to



The area under the wing and cockpit has room enough for the radio gear—as long as you use mini equipment!

place it, or be particularly careful when sanding the wing.

Though its shape is unusual, the fuselage isn't difficult to build, as long as you follow the instructions. It has a conventional firewall with a second, motor-supporting bulkhead (an idea that could be used in other kits). After framing the lower half of the fu-

the flight batteries.

The stab is a simple, open structure that's built directly over the plans. The rudder is of sheet balsa, and you only have to mount the steerable tail wheel. Because of the fuselage's shape, the tail group is built onto it, and this makes covering a little more difficult. Whenever possible, I pre-

fer to leave the tail off until it has been covered.

The Hots' framed-up structure weighed an incredible 9.5 ounces, ready for covering.

FINISH

To finish the Hots, I turned to my favorite covering material: Ora-

tor shaft (it either had a burr inside, or the shaft hole had been improperly drilled), so I discarded it and used an available spare. After that, I mounted the supplied Tornado 7x6 prop and Goldberg* spinner.

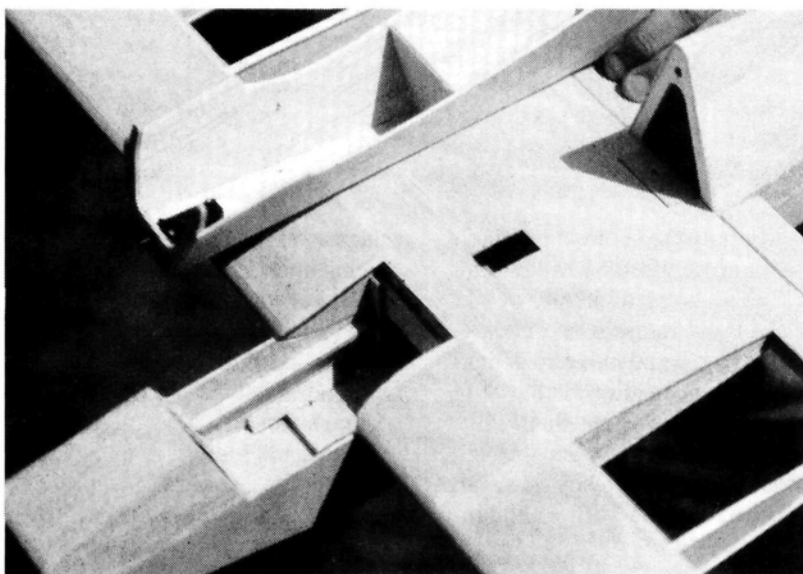
I used Velcro® to mount the Airtronics* MA3 ESC in the area

improves its flight performance.

I used an Airtronics Vanguard 4 FM with four no. 401 miniservos. The receiver is a moderately large, dual-conversion unit that I mounted in the fuselage (behind the wing and under the wooden pushrods). The rudder and elevator servos had to be mounted on wooden rails at the rear of the fuselage wing opening. The aileron servo is mounted inside the wing so that the output wheel just sticks out above the sheeting on the bottom of the wing.

I had to bend the aileron pushrods to go out to the aileron horns through two slots in the fuselage sides. This linkage has several bends that aren't easy to get just right but, once bent, they work perfectly. With a 6-cell 1200mAh battery pack, the plane's all-up weight is 41 ounces, which yields a wing loading of 15.5 ounces to the square foot. With the gear placed according to the plans, balance was right on.

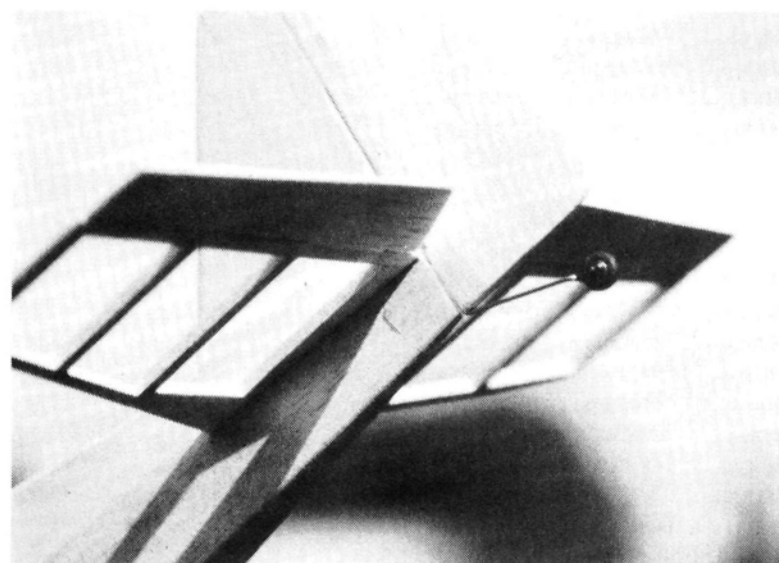
After removing the cockpit hatch, you can easily slide the battery into the fuselage just in front of the wing leading edge.



cover*. (This model is the seventh or eighth I've used it on.) Ora-cover goes on sheeted surfaces without puckering, and this attribute was handy on the Hots' tail/fuselage juncture. Its laminating ability also substantially increased the strength of the soft wing sheeting. I covered the entire model with red and then, for orientation, I added a white tip panel to the right wing and stab. I separated the two colors with blue Pactra* Trim Tape, which is made for R/C car bodies, but I like it because it's flexible. After that, I finished the Hots with the supplied Mylar trim (canopy, landing lights, fuel caps and lettering).

RADIO AND FLIGHT-SYSTEM INSTALLATION

The motor comes with an on/off toggle switch (which I removed because I use an ESC), and it's mounted directly on the firewall with two bolts. The supplied prop adapter couldn't fit onto the mo-



Open-structure stab is light, but strong, and the simple tail-wheel arrangement gives good ground control.

tor shaft. This three-Mosfet electronic speed controller has a voltage-regulated BEC (battery-eliminator circuit) that eliminates the need for an airborne Ni-Cd pack. This reduces the model's overall weight and

FLYING

To check out the Hots' ROG capabilities on a paved runway, I went to Mile Square Park in Fountain Valley, CA. For its first flight, I used a Parma* Matched Sanyo 7.2V 1200mAh pack. If the Hots

flew well on six cells, I knew it would be good on seven.

I don't have a lot of experience with tail-draggers, so my first couple of attempts at an ROG takeoff ended in ground loops. I

eventually got the Hots headed fairly straight down the runway, and it lifted off. Wow!—and double wow! I don't mean to sound over-enthusiastic, but after only about 15 seconds, I knew I



READER'S REPORTS

LARRY PAQUETTE OF FRESNO, CA

WHEN I OPENED the box, I had the impression that this was a high-quality kit: all the wooden pieces were wrapped together by size and properly secured; the motor and harness assembly was cradled tightly in a heavy cardboard slot; and it had all the necessary hardware, hinges and even a fuse link! The instructions included a comprehensive booklet and a full-size rolled plan.

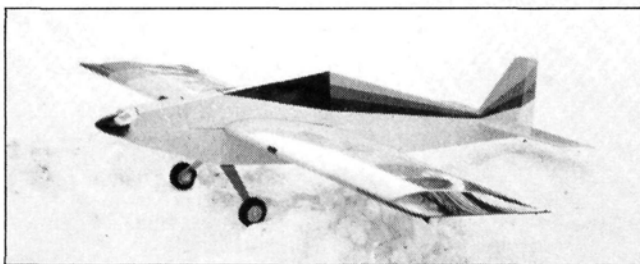
If you follow the instructions carefully, you can assemble the plane very easily. I encountered only a few small problems that were easy to correct. The spruce rails for the aileron servo were about $\frac{1}{16}$ inch too short, so I added two half-ribs inboard of the no. 1 ribs, which also strengthened this area. The horizontal stab is a built-up assembly in a box configuration. I strengthened it by adding $\frac{1}{16}$ -inch diagonal braces, and I substituted $\frac{1}{4}$ -inch dowel stock for the elevator and rudder pushrods. Because the kit-supplied nylon propeller was hopelessly bent and warped, I replaced it with a Master Aircscrew* Adjustable Propeller, which is designed specifically for electric airplanes.

After I had covered the plane with MonoKote, it balanced easily (without adding any weight) and, by moving the motor battery, I could adjust the CG.

I installed a 7-channel Futaba* radio (which allowed channel mixing for the aileron and rudder) and, since I didn't have the recommended 7-cell battery (and because I was anxious to fly my new plane!), I installed the available 6-cell battery. The Hots didn't seem to know the difference!

Flying this airplane is a barrel of fun! It doesn't have to be hand-launched and, after a 25-foot take-off run, it lifted off with ease. If you use the control throws shown in the plan, the plane will be very responsive and will easily perform rolls, loops, spins, inverted flight and snap rolls; with care on the sticks, it will even fly a knife-edge!

Overall, I think the Electric Hots is a high-quality kit. For an electric airplane, it exhibits a surprising performance level, and I thoroughly enjoy flying it. I expect to have countless hours of fun with it in the future!



BREN BAILEY OF ORONO, ME

I BOUGHT MIDWEST'S Electric Hots because winter is brutally cold in Maine, and model assembly and engine tuning in the frigid climate make you so uncomfortable that flying is actually impossible! Small electrics enable you to leave your warm car, take off, maneuver and land so quickly that the cold is tolerable. Two years ago, I was

content with 3-channel, cabin-type, electric models but, last winter, I wanted something more challenging.

The quality of the Electric Hots kit was exquisite! From the incredibly detailed assembly manual to the extensive, accurate die-cutting—every component was absolutely first-class! Because of this, construction flowed

smoothly, and the Hots was ready for its test flight just two weeks after I had started!

I installed a Futaba Attack 4NBL receiver with integral speed controller and BEC along with three S-133 microservos. An SR 7-cell 1250mAh Magnum* pack provided the power. Covered with several colors of Black Baron* film, the Hots weighed 36 ounces for a wing loading of 15.1 ounces per square foot.

I didn't break-in the motor because it wasn't in the instructions—this was a mistake. The Hots took off from the pavement in a reasonable distance, but into a fairly brisk wind. Its climb,

however, was barely perceptible and, with each turn, it lost altitude—aerobatics were out of the question!

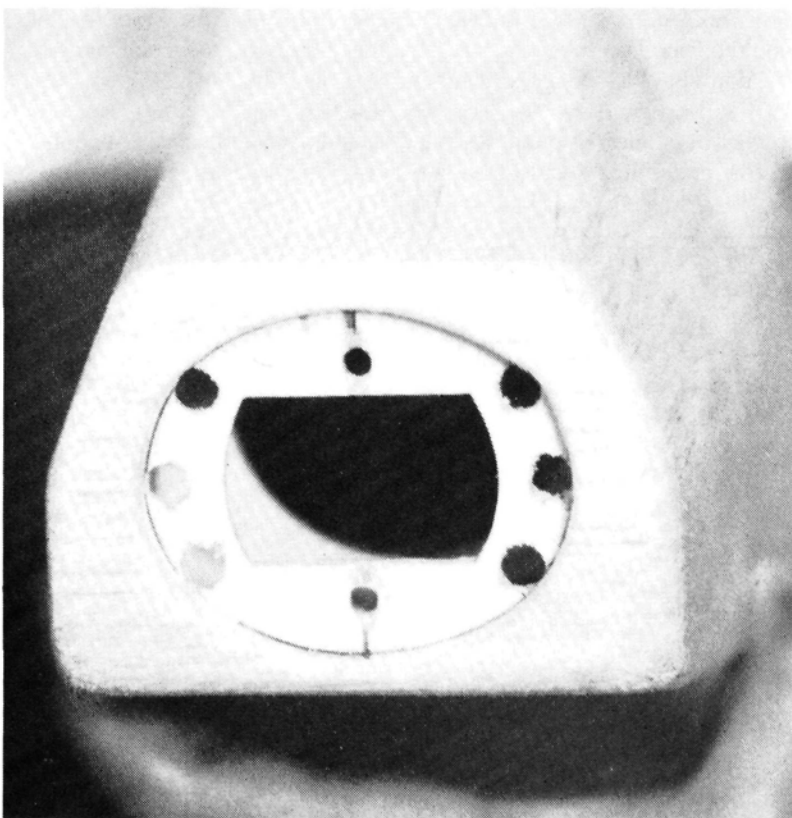
After some research, I tried the R/C car modelers' break-in method—running the unloaded motor under water for 30 seconds. It worked, and now my Hots climbs with authority and yields 4- to 5-minute aerobatic flights!

Although I wouldn't characterize the Electric Hots' capabilities as "sparkling," it performed well enough for me to continue flying it in the summer—my high-wing electrics spent the season in storage!

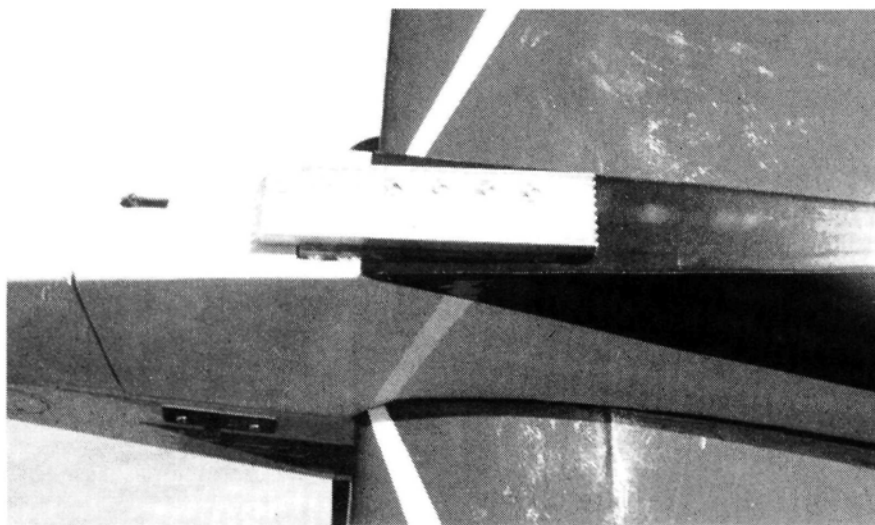
had a winner! On my first return-pass across the field, I tried a roll (on rails!); then a loop from level flight—right around without a dive for additional air speed; then inverted flight—steady as could be with no loss of altitude. Suddenly, the MA3 cut the power to the motor, and the Hots did a great glide and then made a picture-perfect landing. I could hardly wait to get another battery pack into the fuselage! (I hadn't needed a single click of trim.)

Next, I installed the 7-cell 900mAh pack, practiced my take-off technique (only one ground loop, this time), and headed skyward for another exhilarating flight of loops, rolls, split-S's, Immelmans, hammerheads and inverted flight. With the 7-cell pack, the climb rate was better, but air speed was only slightly faster than with the 6-cell pack.

It was time to try out the 7-cell 1200mAh pack. This pack brought the model to its highest



As well as the two mounting holes (top and bottom), the firewall has several air-passage holes.



The cockpit latch is unobtrusive and allows fast, easy access to the inside of the model.

flight weight (42.5 ounces), and I wasn't sure whether its handling would be affected. By then, I was starting to get a grasp on takeoffs: a little right rudder, straight down the runway, lift off—just like a pro! With this pack, the Hots had an increased air speed and a good climb rate. I went for some alti-

tude and decided to try an outside loop—a maneuver few electrics perform. No problem!—the Hots handled it and performed an outside loop from upright or inverted entry.

The Electric Hots really is "hot"! If you're ready to enjoy "power"-style flying—but qui-

etly!—the Hots is for you. It's a high-quality kit with great instructions, and it performs well! What more could you ask for?

**Here are the addresses of the companies mentioned in this article and the Reader Reports:*

Midwest Products Co., 400 S. Indiana St., Hobart, IN 46342.

Oracover; distributed by Hobby Lobby International, 5614 Franklin Pike Cr., P.O. Box 285, Brentwood, TN 37027.

Pactra/Plasti-Kote Co., 1000 Lake Rd., Medina, OH 44256.

Goldberg Models Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Airtronics Inc., 11 Autry, Irvine, CA 92718.

Parma International Inc., 13927 Progress Pkwy., North Royalton, OH 44133.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Black Baron; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044.

Magnum; distributed by SR Batteries Inc., P.O. Box 287, Bellport, NY 11713.

MonoKote; distributed by Top Flite, 2635 S. Wabash Ave., Chicago, IL 60616.

Master Airscrew; distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401. ■

INTRODUCTION TO

SCRATCH-BUILDING

PART II

by DAN SANTICH

AFTER YOU'VE DONE it a few times, you'll take radio installation for granted, but it's important to learn the basics in the beginning. There are several major factors to consider, and balance is one of them.

A BALANCING ACT!

Imagine an airliner in which all the passengers and the baggage are in the rear. The plane would be a real tail-dragger, and its pilot would be in for a big surprise when he eventually got airborne. Improper "baggage" location can bring about the same condition in your model.

Fuel is baggage, but because it (and therefore its weight) diminishes as you fly, ensure that your airplane balances when the tank is empty. Without fuel, your plane should balance slightly nose-heavy—*never* tail-heavy. If it's tail-heavy, you're in for a wild ride at best and a crash at worst.

The radio, too, is really just baggage, and it must be loaded according to the airplane's flight dynamics and its center of gravity (CG), or balance point. If you don't take this into account, you'll have to compensate for the weight shift by adding weight to the nose or the tail. This is "dead" weight that your airplane might not be designed to carry.

RADIO INSTALLATION

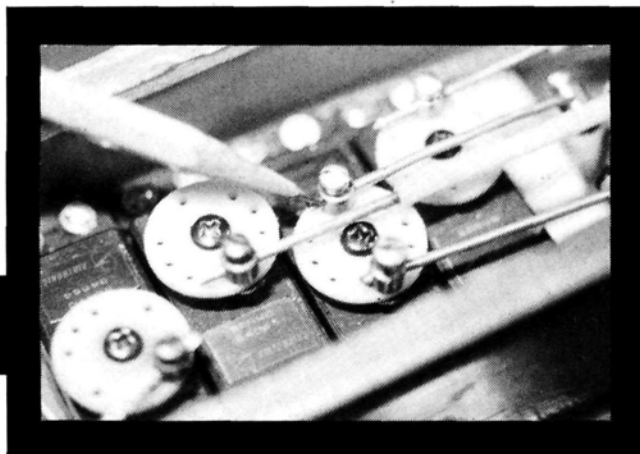
● **SERVOS:** these are usually the heaviest baggage, followed by the battery and then the receiver. The ideal location for any excess baggage is right on the CG (center of gravity), or

Increase the life expectancy of your model with a carefully planned radio installation

balance point. Obviously, you can't put it all at that point, so you must spread it around. Just remember that if you add 4 ounces aft of the CG, you'll have to add the same amount in front of it.

Radio installations in sport models usually have the elevator and rudder servos side by side at the rear of the radio compartment and the throttle servo just in front of these. Sometimes, you can put all three alongside one another. Hold three servos, and you'll see that you have a substantial weight for which to compensate, and the farther they are from the CG, the worse your balance problem will be. It's therefore essential that you put the servos as close to the CG as possible, while still leaving enough room for the receiver and battery.

Servos are more than just little electric motors that drive the control surfaces. They're packed with precision gears and electronics, and they must be protected from engine vibration. As well as that, they must be secured so that they can't move around. Again, we have to compromise. Because the servos are sensitive, they must be protected from vibration. Use *rub-*



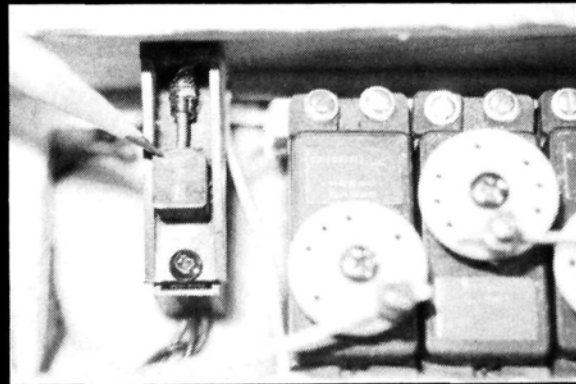
Here's a full, four-servo installation in a completed airframe. Note the servo-arm clearance and the use of swivel hardware to attach the pushrods.



Foam rubber protects the receiver against vibration. Don't pack it tightly, or protection will be lost.



Foam padding protects the battery against vibration. (Natural rubber foam is strongly recommended.)



A switch holder not only protects the switch from oil and dirt, but it's also neater. Note the extension wire, which allows on/off switching without wing removal.

ber grommets to mount them on the *plastic* servo tray provided with your radio—a double buffer from vibration. Of course, with these buffers, there will be a little play or servo movement, but it shouldn't be enough to cause sloppy control response. Never apply so much torque to the servo-mounting screws that you flatten the grommets. If you do, they'll lose most of their ability to absorb shocks.

If you use the servo tray provided, mount it on hardwood rails, and secure the rails to the fuselage sides with braces or triangle stock. If your servos are mounted directly on the wooden rails, make sure the rails are secured with braces.

● **THE BATTERY:** this is the second-heaviest piece of baggage, and it's usually placed forward of the CG to compensate for the servos. Position it so that it counterbalances the servos—usually in front of them and close to the fuel tank.

Like the servos, batteries must be protected from engine vibration. Their sensitive plates and chemicals can really be upset by abnormally severe vibration, so wrap your battery pack in foam rubber. Since it's also near the fuel tank, you should put your foam-wrapped battery into a plastic bag, just in case fuel leaks.

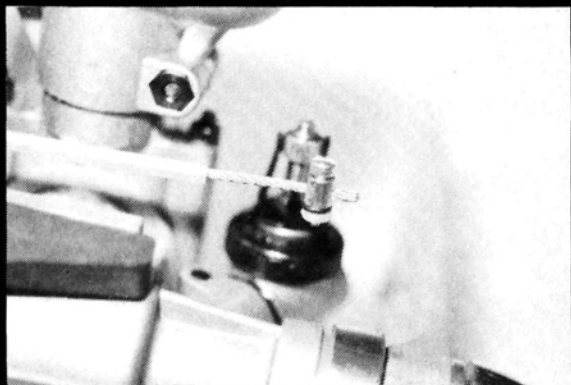
Hold the battery securely in your airplane, because you don't want it to move around during flights. If it does, it could interfere with servo action, or worse, it might become disconnected. If this happens in the air, your chances of saving your airplane aren't very good. Your battery should fit snugly, but if your fuselage is big, you may have to mount it inside a box that's fixed to the airframe, or put balsa rails on top of it to prevent it from moving around.

● **MOUNTING THE SWITCH:** "No problem," you say? Believe it or not, problems with switches have caused many models to crash. Why?—vibration! That's right; it can tear that switch apart in short order. To function, the contacts inside it must move from one position to another, and because of this, they can't be secured. The contacts are metal, and you know what happens when you rub metal against metal without lubrication: parts wear out—fast!

The switch must also contend with deposits of fuel and dust. For this reason, you should mount it inside the airplane, but use a commercial switch mount that allows access by way of a push/pull (on/off) extension. The switch is usually installed between the battery and the receiver, and the push/pull extension should exit the fuselage opposite the engine exhaust.

● **THE RECEIVER:** this is the delicate "heart" of the system and should be treated accordingly—with special attention! Because it's usually the lightest component in the airborne baggage, we can put it anywhere within the range of the receiver wires without bothering the airplane's balance point. In a normal radio installation, never use excessively long servo-extension leads to attach a servo to a receiver. If you do, you should add noise "traps" and use a larger battery.

In the receiver, we have the crystal, which is the most delicate part of our airborne system, and we must be careful with it. Engine vibration can drive a receiver crazy, so wrap it in foam and position it snugly in the fuselage so that it can't move about. It's also good practice to put the receiver in a plastic bag that's sealed with tape to keep out dust and fuel residue.

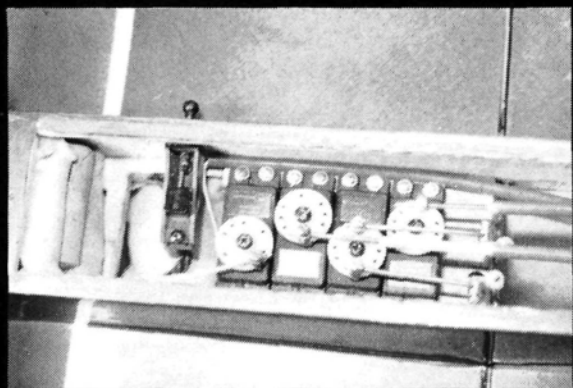


All pushrod linkages, whether to the throttle (as shown here) or to a flight surface, should be kept as straight as possible.



The Nyrod pushrods must be supported at both ends and, during construction, you should also support them in the middle.

SCRATCH BUILDING



The antenna should exit the fuselage opposite the exhaust. It should also be kept as free as possible of servos and servo wires.

• **THE RECEIVER ANTENNA:** again, we have to compromise. Antenna position is very important. To receive signals from the transmitter most effectively, the antenna should be at 90 degrees to it, but this is obviously impossible because the airplane is constantly changing position and attitude. So what can we do? Fortunately, our receivers are sensitive enough to pick up signals that are weak or diminished because of these changes in position. To ensure that my receiver picks up the transmitter's signal during any situation or attitude, I usually bend at least the last 6 inches of my antenna until the end is at 90 degrees to the rest of it. It's just extra insurance.

The receiver antenna shouldn't flop around; if it does, it could catch in the propeller. To secure the antenna, attach a

small rubber band to the vertical fin, stretch the band forward and then tie the antenna to it. Better yet, use the small plastic clip that comes with your radio. *Never shorten or lengthen your antenna* because it's tuned to the receiver when it comes from the factory, so tying a knot in it will really mess things up.

• **SERVO OUTPUTS:** every radio set comes with an assortment of round and straight servo outputs. (The straight ones are called "arms.") When you attach either type to a servo, ensure that the pushrod attachment hole is at 90 degrees to the fuselage's center line, and secure the output arm with the screw provided. When you attach the pushrod to the servo output, be sure that the output rotates freely in both directions without binding. Don't use a clevis on a round output—use either a Z-bend in the pushrod wire or an EZ link.

For more information, read my article, "Basic Control Systems," in the September 1986 issue of *MAN* (now available from Kable News Company*). For information on more advanced systems, I recommend Jim Newman's "Control Systems." It contains good information and illustrated examples of hookups for articulated flaps, folding wings, etc., and it's available from *Model Airplane News** (\$4.95, plus \$2.95 for shipping and handling).

Take your time with this critical part of your model's assembly, and you'll really enjoy all this hobby has to offer. Good luck!

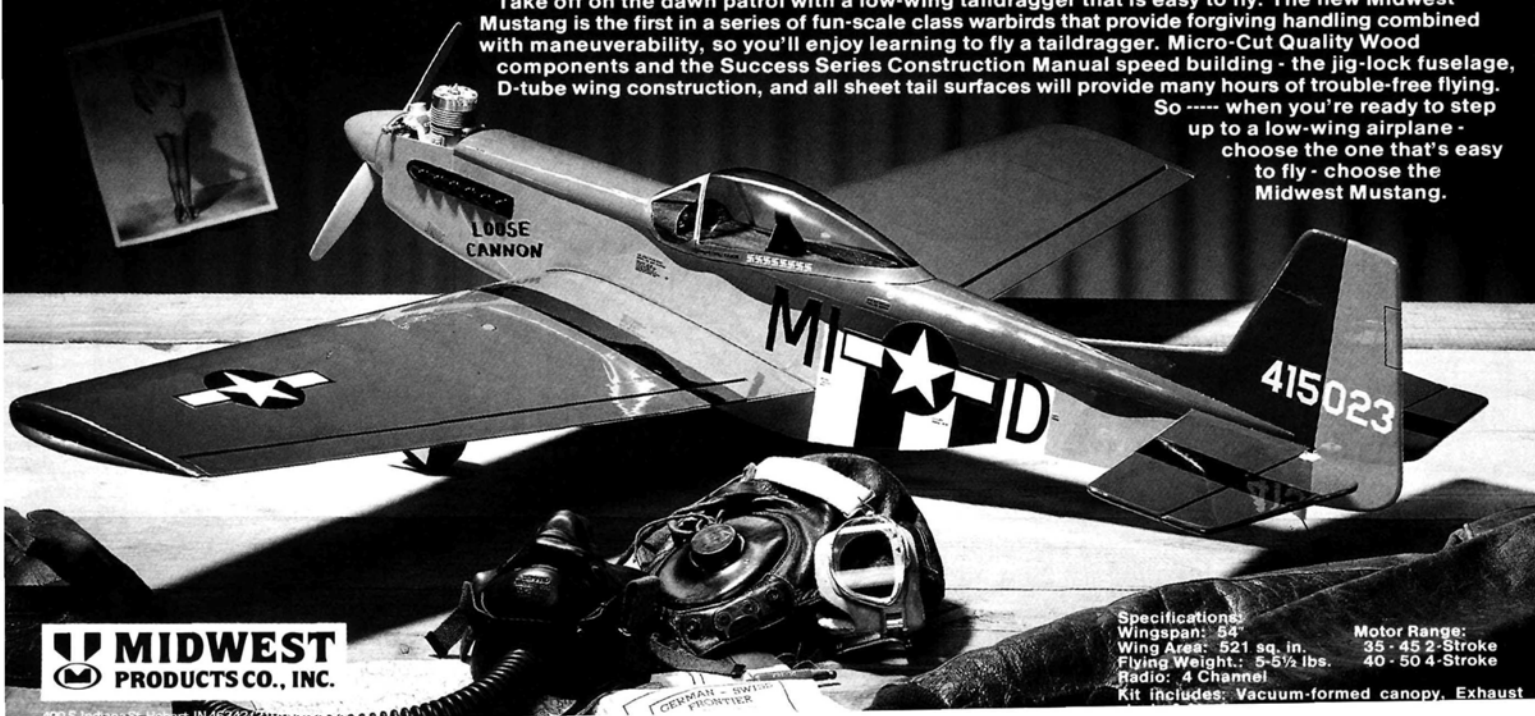
*Here are the addresses of the sources mentioned in this article:
Kable News Co.: call 1-800-435-0715.
Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

MIDWEST MUSTANG

Join the Midwest Air Force . . . Form Your Own Squadron

Take off on the dawn patrol with a low-wing taildragger that is easy to fly. The new Midwest Mustang is the first in a series of fun-scale class warbirds that provide forgiving handling combined with maneuverability, so you'll enjoy learning to fly a taildragger. Micro-Cut Quality Wood components and the Success Series Construction Manual speed building - the jig-lock fuselage, D-tube wing construction, and all sheet tail surfaces will provide many hours of trouble-free flying.

So ----- when you're ready to step up to a low-wing airplane - choose the one that's easy to fly - choose the Midwest Mustang.



MIDWEST
PRODUCTS CO., INC.

400 S. Indiana St., Hobart, IN 46342

Specifications:
Wingspan: 54"
Wing Area: 521 sq. in.
Flying Weight: 5-5 1/2 lbs.
Radio: 4 Channel
Kit includes: Vacuum-formed canopy, Exhaust

Motor Range:
35 - 45 2-Stroke
40 - 50 4-Stroke



FIBERGLASSING SHEETED WINGS

A "Sporty Scale" Special, Part II

by FRANK TIANO

A PPLYING FIBERGLASS cloth to a balsa structure is commonly called "glassing." Years ago, modelers applied many coats of model-airplane dope to balsa to create a more durable surface—one that could be readily painted and that would resist a certain degree of "hangar rash." Later, someone suggested adding a layer of tissue paper to the doped surface for an even better finish; and still later, for increased durability, we incorporated heavy silkspan on our large, heavy flying models.

The biggest breakthrough in protecting a model's very delicate balsa structure came in the mid '60s when someone suggested bonding a layer of very light fiberglass cloth to it. Because it increased a model's life, the new method provided just about everything an R/C pilot could hope for! The fiberglass-cloth-and-resin combination creates a tough "skin" that's

easy to paint and is as resistant to "dings" as possible. As a bonus, the fiberglass cloth helps to prevent the balsa from splitting along its grain in the event of a hard landing.

This glassing procedure was confined to more serious modelers; competitors, if you will. A hot Formula I pilot or an expert pattern flier wouldn't be caught dead without a glassed airplane, and many of the up-and-coming scale pilots learned the same thing: if you wanted an airplane to last, iron-on coverings just weren't the way to go!

Today, with the introduction of a new ARF every other minute, fewer and fewer people enter our sport for the enjoyment of *building* model airplanes. Many of them have an entirely different interpretation of the word "dope"; they've never heard the word "silkspan"; and they'd certainly be mortified if their new kit actually involved more than a dozen steps from

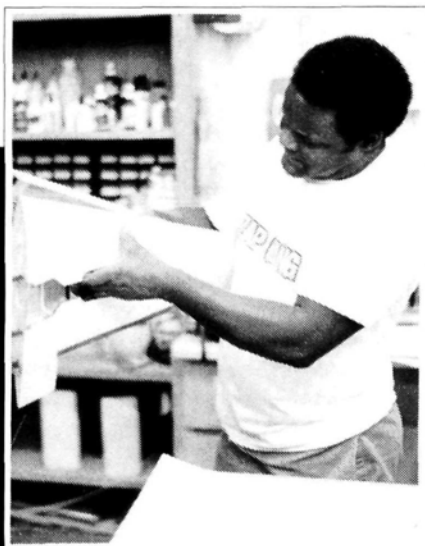
start to finish!

Every day, someone comes into my shop and asks how to do something that I find elementary. They just haven't been exposed to the art of model building. For them, model-aircraft *flying* is a hobby, but model-aircraft *building* is as far from their minds as it can be!

Because of all the wonderful ARFs available today, fewer and fewer modeling skills are being passed from one enthusiast to another. Glassing is one of these mysterious skills. Although it isn't quite as intimidating as skinning a foam wing, it probably ranks right up there with meeting your girlfriend's parents for the first time!

MATERIAL MENAGERIE

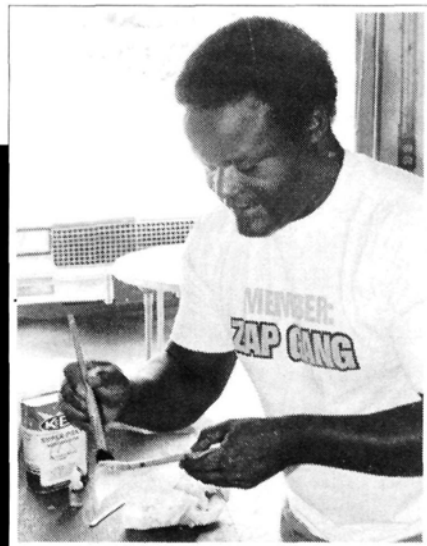
To fiberglass a fuselage, wing, or stab successfully, you must first get all your materials together. You'll need a smooth, clean work surface, a couple



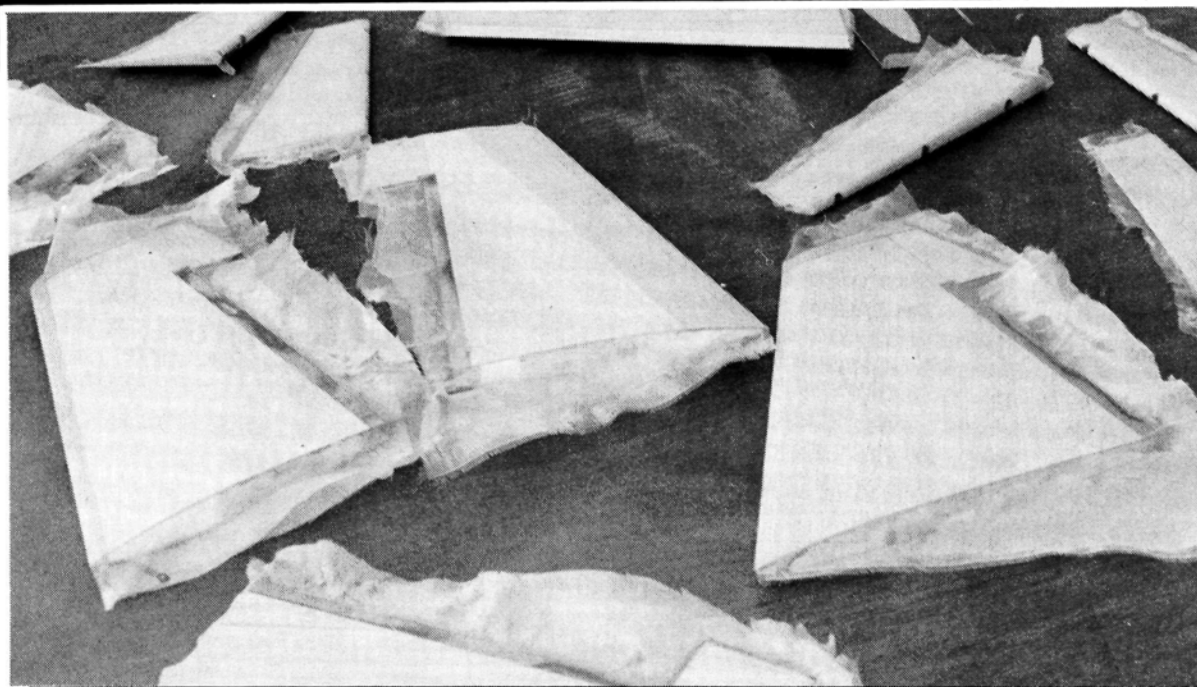
1. Sand the structure very carefully. Glass-cloth is so fine that any little protrusions will snag it and cause it to run—just like a nylon stocking.



2. The cloth is cut slightly oversize and laid over the parts that will be covered. (Sharp scissors are a must!) You can use either polyester or epoxy resins and achieve good results.



3. Using a soft brush, work the resin through the cloth's weave and onto the balsa. Brush it out toward the edges.



All these parts were glassed on both sides in one day, and this includes the time spent waiting for the first side to cure!

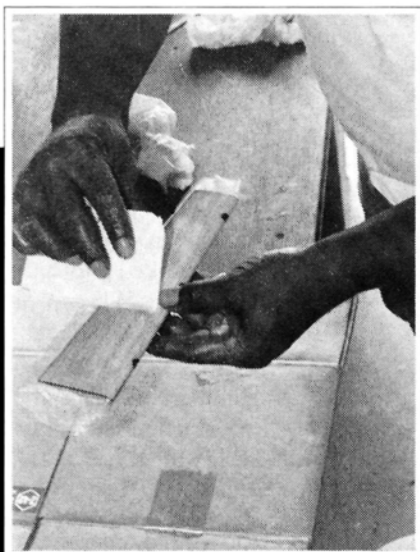
of yards of light fiberglass cloth, epoxy resin or polyester resin, some throw-away brushes, a good 1-inch brush, a squeegee (a playing card, an old credit card, or one sold by Sig*), a very sharp pair of "shop" scissors, some single-edge razor blades, a few mixing cups and an 8x3-inch sanding block.

Fiberglass cloth is classified according to how much 1 square yard of it weighs (e.g., 2-ounce cloth means that a 36x36-inch piece weighs 2 ounces). We want a high-quality,

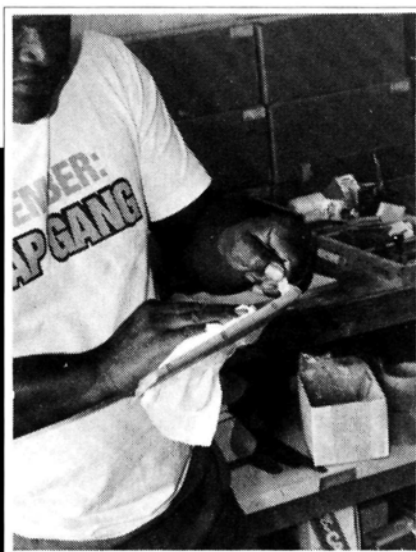
lightweight cloth with a close weave. K&B Manufacturing* offers such a product, and you can buy it in 1-yard packages at your favorite hobby store. I prefer the cloth sold by Dan "Pappy" Parsons* in Albuquerque, NM, and my reasons are simple and numerous. For one thing, most lightweight cloths claim to weigh $\frac{3}{4}$ ounce, but many actually approach $\frac{7}{8}$ ounce. (Not too bad though, unless you're building a very "weight-conscious" airplane.) For those of you who care, however,

Pappy's cloth weighs $\frac{3}{5}$ ounce per square yard, whether you buy it today or next July—whether you buy 1 yard or several! Second, I find the luxury of buying more than a single yard in a package really advantageous, especially when I'm glassing one half of a 90-inch wing that requires a piece of cloth that's at least 50 inches long if you include the overhang. Experience has played a part in my preference. I simply prefer the way Pappy's cloth

(Continued on page 63)



4. Charlie uses a squeegee to wipe away the excess resin. Don't leave any puddles.



5. Another way to remove excess resin is to use a paper towel. The surface should appear a little "wet," but it shouldn't have brush marks or streaks.



6. Here's a finished wing panel. After the resin cures for a few hours, the extra cloth is cut and sanded.

Build a SOLAR- POWERED Ni-Cd Starter Charger

by JOE CLOUD

IF YOU LIKE gizmos, here's a project for you! This circuit can be used at the field to top off a charge, or to recharge a completely dead Ni-Cd glow battery. It has two major advantages: it's easy to make and use, and it will work almost anywhere there's sunshine!

Here's how to assemble your own solar-powered

Ni-Cd starter charger. Refer to the diagram and photos as you go along.

1&2. Cut the wire on the Ni-Cd charger in half. On the part that plugs into the wall, slice the wire approximately 1½ inches along its length (from the end that you just cut). Strip off approximately ¼ inch of the insulation, twist each wire to form a clean bundle, then "tin" them with solder.

3. Separate the wires, and then connect the voltmeter across them. From the meter reading, determine which wire is positive and which is negative, and label them with pieces of tape. Cut two short sections of

heat-shrink tubing and place them on the wires.

4. Now solder the positive (+) wire to the center stud of one of the power jacks, and solder the negative (-) wire to the outer ground contact.

5. Slide the heat-shrink tubing over the wires and contacts, and shrink it with a heat gun. Wrap the jack and wire with tape, or shrink a piece of large heat-shrink

tubing around them.

6. Next, connect the two solar cells by soldering a wire from the negative terminal of one to the positive terminal of the other. (The positive terminal is marked with a red dot.) When you've finished, the two cells should be connected by one piece of wire, with a positive (red) wire coming off one, and a negative (black) wire coming off the other.

7. Drill a small hole in the case cover for these red and black wires and a larger hole for the second

TOOLS NEEDED:

- ▣ Soldering iron and solder
- ▣ Wire cutters
- ▣ Needle-nose pliers
- ▣ Heat gun
- ▣ Volt/ohmmeter
- ▣ Drill and bits
- ▣ Silicone adhesive or double-sided tape
- ▣ Masking tape



This inexpensive circuit + sunshine = charged Ni-Cd glow batteries

PART	QTY.	RADIO SHACK PART NO.	PRICE
Commercial Ni-Cd starter battery with charger	1	N/A	N/A
Solar cell	2	276-113	\$5.95 each
Diode 1N4001	1	276-1101	\$.49 for two
Power jack	2	274-1563	\$1.59 each
Power plug	1	274-1569	\$1.29 for two
Heat-shrink tubing	1	278-1627	\$1.79/assortment

Assorted wire (preferably red and black 20-gauge)
Project box (either homemade or commercially available)

power jack. Mount the jack with the hardware provided, and insert the red and black wires coming from the solar cells through the small hole.

8. Using silicone adhesive or double-sided tape, mount the solar cells on the case cover. Cut a few pieces of heat-shrink, and slide one onto the positive wire coming from the solar-cell pack.

9. Solder this positive wire onto the center contact of the power jack, and solder the negative wire onto the cathode end of the 1N4001 diode. (This is the end that has a band molded or imprinted on it.)

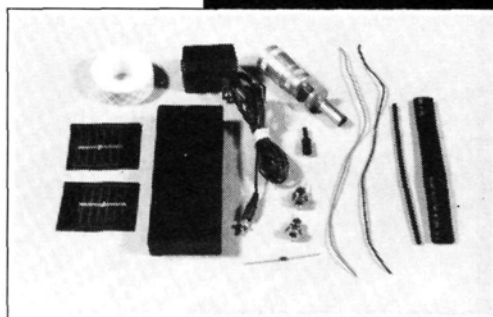
10. Solder a piece of wire onto the other end of

the diode (i.e., the anode), slip a piece of heat-shrink tubing over it, and then connect it to the power jack's ground lug. Slide the heat-shrink over the contacts, and shrink it with a heat gun.

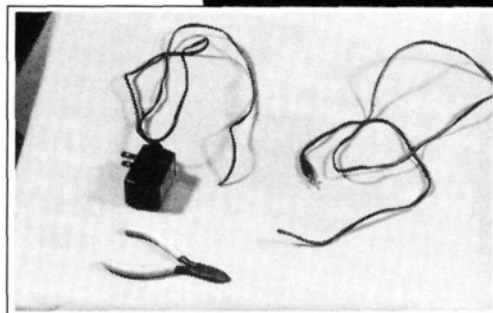
11. Using the volt/ohmmeter, determine which wire is connected to the special Ni-Cd plug tip (remember: this is positive) and which is connected to the nut-shaped ground (i.e., the negative terminal).

12. Slide the wires through the power-plug sleeve, and slide a piece of heat-shrink over each. Solder the positive wire to the power plug's center contact and the negative wire to its ground lug. Slip

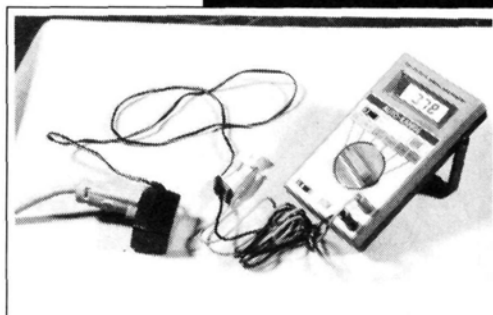
(Continued on page 52)



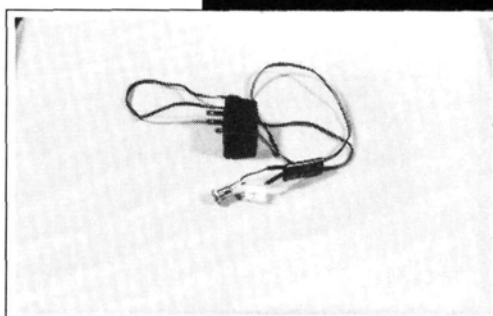
1. The necessary materials. You'll also need a soldering gun and a volt/ohmmeter.



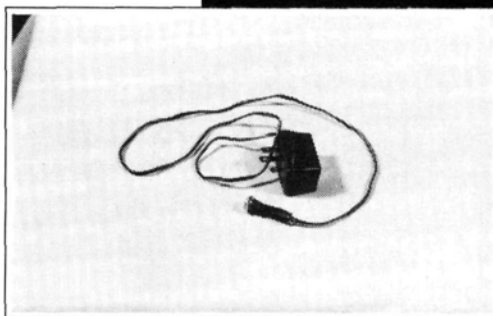
2. Cut the original Ni-Cd charger wires.



3. Use a volt/ohmmeter to identify the positive and negative wires.



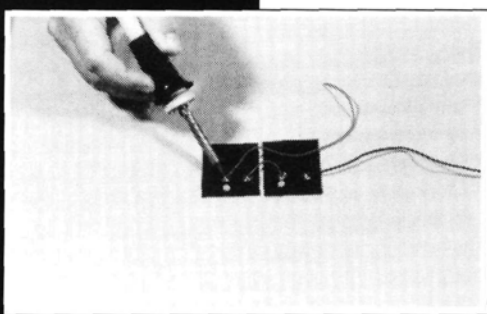
4. Modified wall charging unit prior to shrinking the heat-shrink tubing in place.



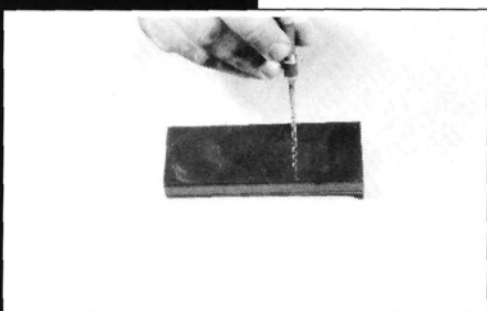
5. Finished wall charging unit.

PHOTOS BY JOE CLOUD

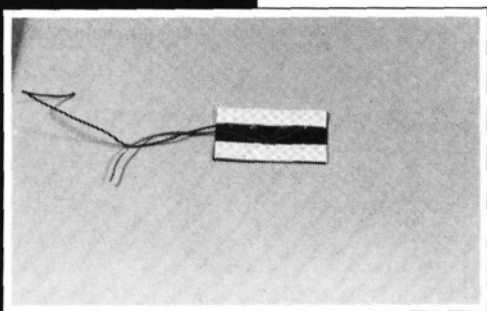
6. Connect the solar cells in series.



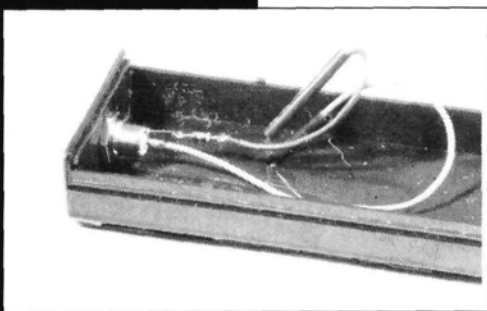
7. Drill the case to accept the wires and the power jack.



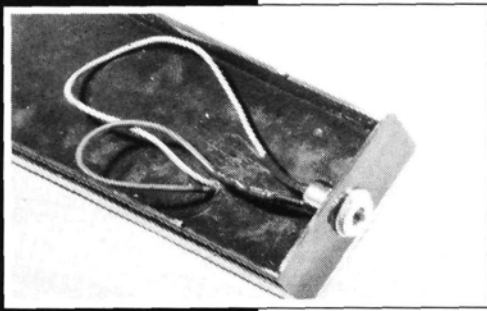
8. Attach the cells to the case cover with double-sided tape.



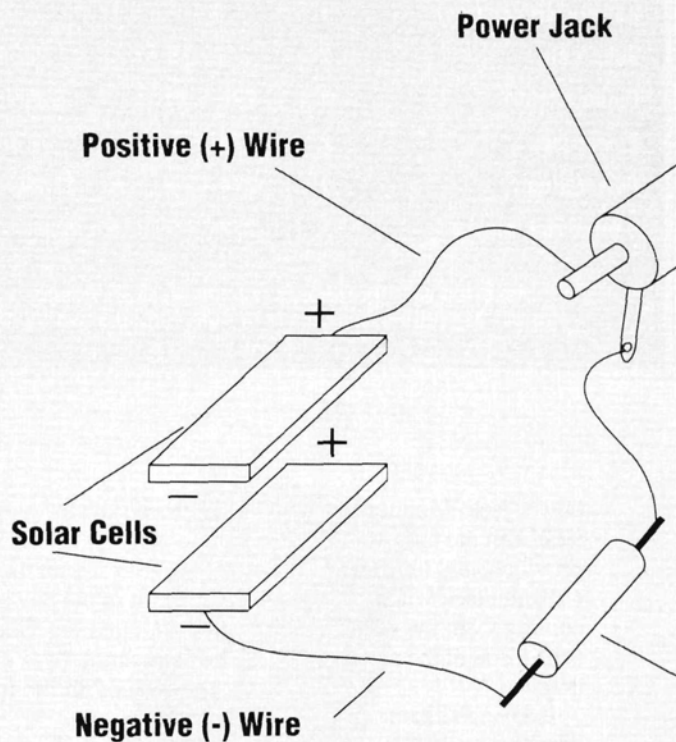
9. Case assembly showing the hookup of diode and wires. Note: the positive wire is soldered to the jack's center contact.



10. Finished case.



SOLAR-POWERED



(Continued from page 51)

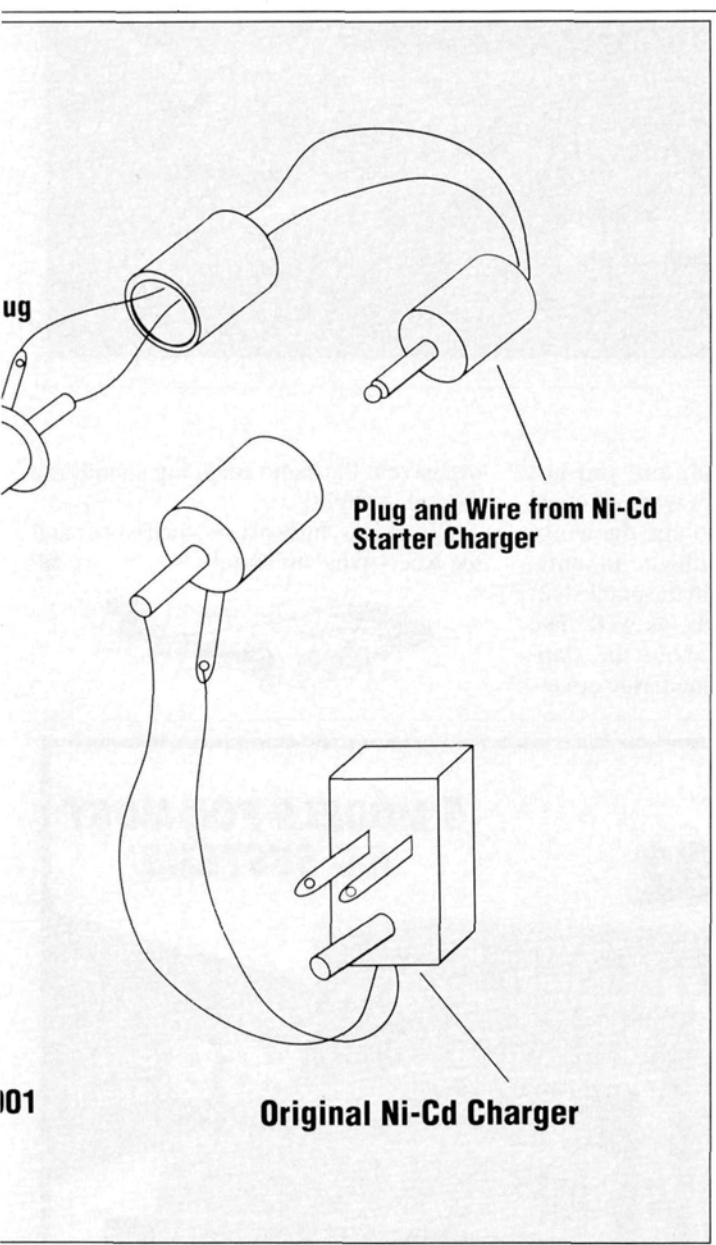
the heat-shrink over the wires and contacts, and shrink it with a heat gun.

13. Screw the sleeve over the assembly, and you've finished!

14&15. The jacks and plug allow you to use either the usual wall charger or the solar charger to charge

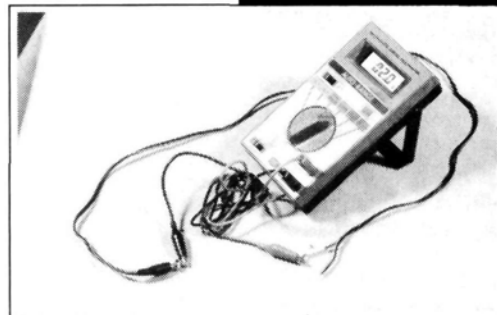
your Ni-Cd glow battery.

In full sunlight, the solar cells on the parts list deliver only 70 milliamps, which is less than the C/10 rating (the rate required to charge a battery in 10 hours) of a regular 1200mA Ni-Cd glow-plug battery. This is also less than a usual slow

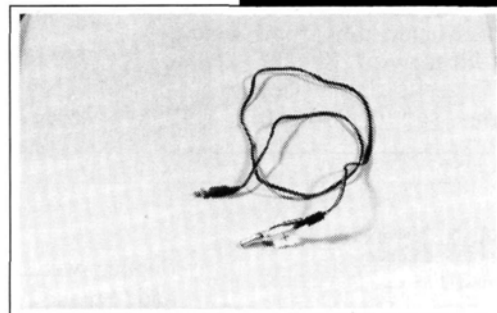


charge for the cell, so there's little risk of overcharging the battery. You should be able to leave the plug's battery on the charger whenever it isn't connected to a glow plug. This way, your Ni-Cd glow battery can be refreshed between flights!

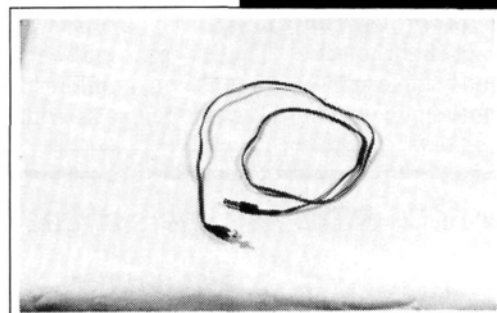
Note: don't worry about clouds or someone blocking the sunlight for a few moments; the 1N4001 diode prevents the battery from discharging through the solar cells during periods of little or no illumination. ■



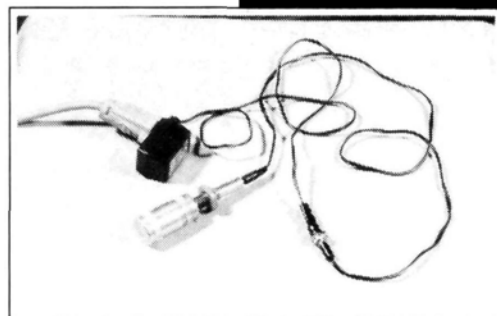
11. Use a volt/ohmmeter to determine which wire goes to the tip of the charging plug.



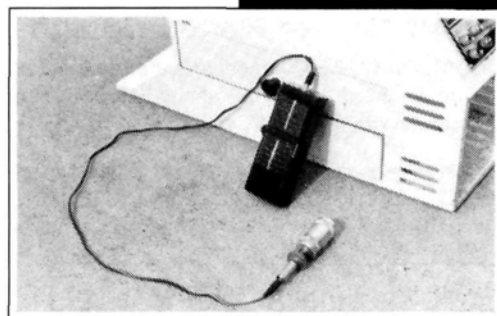
12. Charging plug before shrinking the heat-shrink tubing. Solder the positive lead to the power plug's center contact.



13. Finished power plug.



14. Using the power plug with the wall charging unit.



15. Using the power plug with the solar charging unit.

Something For Everyone.

If you're interested in ducted fan or "jet" airplanes, then the one name you'll need to know is Jet Hangar Hobbies. For years, JHH has been producing the finest ducted fan airplane kits available.

American made with top quality balsa, foam and epoxy fiberglass, these kits are so true to scale that they have "starred" in several films including Top Gun and Iron Eagle.

Engineered to be easy to build, all JHH airplanes have an extremely broad performance range, making them very easy to fly. Even if you're new to ducted fans, there's a Jet Hangar kit for you. Best of all, JHH kits are affordable! Come in or call today, see for yourself.

JET HANGAR HOBBIES, INC.

12130G Carson
Hawaiian Gardens, CA 90716
(213) 429-1244 • FAX (213) 429-6648

Dealer Inquiries Invited.

©1990 JET HANGAR HOBBIES, INC.

FIFTY YEARS AGO

(Continued from page 11)

The flapper was easy to fly: you could launch it in any attitude and, powered by an 11-inch loop of brown rubber, it climbed steeply in tight circles. The model was inherently stable and wouldn't stall, regardless of its angle of attack. The

flapper was easy to build, too; you just had to make sure the spars were identical in flexing and strength so that the wings flapped in unison and without vibrating. Symmetry was essential in the crankshaft arms and connecting rods, as well. The most interesting thing about the flapper?—its crinkly, superfine tissue cover-

ing gave it the same snapping sound as a pigeon in flight!

Big planes, little planes, the flapper and the Roc—what an issue! ■



Over 5000 RCD customers already know...

ALL "AMA-LISTED" 1991 RECEIVERS ARE NOT CREATED EQUAL!

THERE ARE TESTS AND THERE ARE TESTS!

Many "1991-LISTED" receivers claim to meet "Testing" guidelines but FAIL the only TEST that really matters:

SURVIVABILITY IN THE REAL WORLD.

- ➔ RCD offers the ONLY DUAL-CONVERSION AM receivers that pass laboratory "TEST" and SURVIVE PAGER-INFESTED SKIES!!!
- ➔ RCD FM DUAL-CONVERSION receivers are the most selective, and therefore the most RELIABLE of any FM receiver currently available from the other guys AT A FRACTION OF THEIR COST!!

DON'T GET SHOT DOWN! (or "HELD UP")

- | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| ➤ RCD 100
Futaba "G" AM | ➤ RCD 150
Futaba "J" AM | ➤ RCD 200
Futaba "J" FM | ➤ RCD 300
Airtronics AM | ➤ RCD 400
Airtronics FM |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|

5 MODELS FOR MOST R/C SYSTEMS!

Only
\$69.95*
EACH



See the Complete Line of RCD Receivers From your Local Hobby Shop

Or Order By Phone: **1-800-NOW-GO RC (1-800-669-4672)**

* Plus \$5.95 S & H/Order, & CA sales tax for CA residents. (Allow 2-4 weeks delivery)

Radio Control Development Inc.
9419 Abraham Way • Santee CA 92071
Ph. (619) 449-1112 FAX (619) 449-1002

Every modeling subject you've ever thought of—and then some!

OSHKO

ARTICLE AND PHOTOS by RICH URAVITCH



An aerial view of the world's largest aviation gathering. Ominous clouds!

RETURNING VISITORS to the EAA's annual convention are likely to ask themselves, "What can they do to top last year's show?" The problem is compounded



The Eagles aerobatic team can always be counted on to deliver a crowd-pleasing show.

ASH '90

if you plan to write about it for an airplane audience like the readers of *MAN*. A lot of you have been reading this magazine for longer than I've been covering this EAA gath-

■ It seems the battle lines have been drawn, and the B-24 owned by the Collings Foundation has taken a position (as shown by the sign in the nose gunner's turret).



ering (nine years), and I find myself asking the same question. Well, the answer this year is probably best given by dividing the event's features into two categories—what was and what wasn't—and proceeding from there.

WHAT WASN'T?

This question is the easiest to address because only a few elements were missing—most notably the entire Soviet contingent. This was to have been expanded this year to include the newest version of the awesomely aerobatic Su-26MX, one of their front-line fighters (the Su-27 Flanker), a Yak-52 trainer, an An-124 cargo hauler and a representative example of a Soviet "home-built." It would have provided an ideal opportunity for home-builders to compare notes, but unfortunately, it wasn't to be.

Apparently, there were some problems with logistics (involving the shipment of support equipment for the airplanes) that prevented the Soviets from making a second appearance.



■ A rare machine, and awarded a prize specifically because it is—the Canadian warplane Heritage Hawker Hurricane. It

flew in formation with Spitfires during the Battle of Britain part of the air show.

OSHKOSH



Craig Hoskins can land his Pitts "Double Trouble" in two ways. Most of us have trouble right-side up!



Manfred Radius performs the inverted ribbon pick-up in his high-performance sailplane. Note the wings' reverse flexing.

The other thing that "wasn't" was the usually uninterrupted week of outstanding Midwestern weather. I can't recall experiencing so much sustained rain at Oshkosh—intense heat, maybe; occasional showers, sure; but incessant downpours...nah! I guess one out of nine years isn't all that bad!

WHAT WAS?

Everything else was decidedly on the "plus" side of the ledger. This year's visitors were treated to things they had probably never seen before and, after overhearing a few conversations, it was obvious to me that they came to the show specifically to see certain things.

High on the list in spectator appeal was the static display of the formerly ultra-secret Lockheed F-117A Stealth fighter. It was always surrounded by three rings—military police, a rope and a crowd of enthusiasts (generally three or four deep)! The airplane is remarkably large—slightly larger than an

F-15. It's also remarkably homely; its angular, faceted, RAM (radar-absorbing material)-coated exterior visibly supports the theory that form should follow function!

I watched the "unadvertised" departure of this unique machine early on Monday morning. It performed a number of flybys with its KC-135 tanker/support aircraft, and it sure didn't *sound* stealthy to me! Its twin GE 404 engines don't exactly qualify as "whisper jets"! It was still impressive though—almost as impressive as the ability of Lockheed and everyone else involved with the program to keep it a secret for the seven years during which it has been operational!!

For anyone who wants a chance to be up close and personal with nearly anything that flies, Oshkosh is the place. You can walk right up and touch most of the airplanes on display, including a lot of Uncle Sam's latest. Some of them are cordoned off, but most aren't, and for this reason, the EAA convention is a scale modeler's paradise. Regardless



WILL THE
REAL
F-117A
PLEASE
STAND UP?

Boy, when the Air Force decides to remove the wraps from something, they seem to go 180 degrees from their original direction. At one time, you could be taken in for questioning for even *mentioning* the "Have Blue" project that sired the Lockheed F-117A, or "Stealth" fighter.

Now the actual airplane is turning up at air shows all across the country. Look at these two: one was at Oshkosh, the other in Fort Worth—and not at the General Dynamics plant! Actually, the one in the bright sun with a blue background is a model built by Dave Hudson of Grand Prairie, TX. Dave had the twin-Byrojet-powered bird on display at the recent Greater Southwest Fan Fly, and you can see more in our "Jet Blast Special" coverage of that event in a future issue of *MAN*. Stay tuned!



The EAA Lockheed 12A provides shade for the Wedell-Williams racer crew. The rare Lockheed crashed on the airport later in the week.

The French Connection team fly their CAP 10s through the canopy-to-canopy routine.

of the type of airplane that suits your fancy, I guess you'd find at least one example of it on the ramp or the flight line. I don't know whether anyone has ever compiled a list of all the types of airplane that have showed up over the years, but I think it's safe to say that almost *every* type has been there.

Ducted-fan fanatics will find everything from current F-15s, 16s and 18s through Korean vintage MiGs and Sabres. This year's walk along the warbird flight line gave me a flashback—a privately owned MiG-21 Fishbed in NVA markings brought by the Combat Jets Museum of Texas. Shades of Southeast Asia, circa 1967!

Another jet that caught my attention (especially during the flight demo by Mike Melville) was the proof-of-concept Rutan ARES. This neat little single-place machine was designed as a compact, close, air-support aircraft, and its engine is housed on the left of the fuselage while the right side is occupied by a rotating-barrel mini-gun. Naturally, it fol-

lows the Rutan canard design philosophy and appeared very nimble in flight. It would make a great R/C project!

Forsaking the kerosene burners, home-built enthusiasts found over 300 subjects that had been started in garages or basements and emerged as tributes to what can be accomplished with perseverance. Looking at the full-scale kits that are available today (the type and quality of materials and the level of prefabrication being employed), it's not surprising that more and more people are joining the full-scale movement. Equally unsurprising is the fact that, when questioned, a lot of the builders will tell you that they either started as, or continue to be, airplane modelers. Eagles, Glasairs, Lancairs, Midget Mustangs and a host of Rutan-designed Vari-EZEs and Long-EZEs represented the breed.

OLD-TIMERS & WARBIRDS

Over 500 classic/antique types were on hand (airplanes, not



Rare bird on Western soil (not counting those on Southwestern Air Force bases): a MiG-21PF Fishbed in North Vietnamese markings. It's owned by the Combat Jets Museum.

OSHKOSH



Left: Joe Frasca puts his Laser-like steed through its paces. Let's see...lots of right aileron, right rudder, a fair amount of up-elevator, and Joe is shoved into the right corner of the cockpit. Name that maneuver!

Above: The Eagles aerobatic team—Tom Poberezny, Charlie Hillard and Gene Soucy—waves to the crowd after a super performance. Are those eaglets accompanying them?

spectators!); everything from Wacos, Stearmans, Beeches and TravelAirs through Cubs, Champs and Stinsons. Each had a story—or, at least, the people who came to see them did. More than once I heard a former aviator, with much

fondness in his voice, relive his never-to-be-forgotten first solo while gently caressing the taut fabric of a nearly perfect Stearman or Taylorcraft. Oshkosh isn't just planes; it's *people*!

The warbird troops were out in force with about 240 birds on display, many of which were flown during the air show.



Piloted by Bob Davis, the Super Akro excelled in vertical maneuvers. Smoke systems are now almost standard equipment on aerobatic show aircraft.



One of the French Connection team's CAP 10s at the moment of kick-over on the stall turn. Rudder deflected left and smoke beginning a change of direction.

Mustangs, Trojans, Mentors and Texans had numerical supremacy, but the "veteran" Oshkosh visitor, having already seen many of them, gravitated toward the new kids on the block: Fouga Magisters, Soko Galeb jet trainers from Yugoslavia, the aforementioned Fishbed, an A-4, two F-86s, some T-Birds, an F7F, a Bearcat and lots of others you're unlikely to see together anywhere other than Oshkosh.

SHELTERED SEMINARS!

This year's unsettled weather encouraged us both to seek shelter and to learn something at the many available seminars. On any given day, you could attend free, hour-long talks by experts on subjects ranging from aircraft refinishing (presented by Du Pont) to designing aircraft made of composites. "How To Trim Your Aircraft For Maximum Performance" was another favorite. "Aeromodeling From Start to Finish" was presented by our old friend Bob Underwood of the AMA.

You could easily just attend these forums and never go outside the tents, but if you did venture outside, you headed for the flight line to claim a hunk of real estate from which to watch the air show. Each daily show ran for two or three hours that were filled with demonstrations—all carefully choreographed and scheduled so there was hardly a lull in the activity. The spectacles included precision aerobatics, skydivers, aerial comedy routines, military demos and wing-



NEITHER RAIN, NOR SNOW, NOR SLEET...WELL, NOT RAIN, ANYWAY!

What kind of person sits on the flight line during a downpour to watch an air show? No question: it takes a real enthusiast—someone who's really involved with aviation; but, most of all, it takes someone with the foresight to bring a poncho, a jacket, or some other type of rain gear! The occasional rainstorms at this year's EAA convention didn't seem to dampen the spirits of the hearty souls shown here. Their multicolored cover-ups provided the only break in the gray!

I was less fortunate and managed to get caught on the flight line as the skies opened! Even more unfortunate were the performers, e.g., Jim Clevenger, who got soaked while in his open-cockpit Wedell-Williams racer replica. This is surely one of the reasons they invented full canopies, n'est-ce pas?



OSH KOSH



Gene Soucy drives his Show Cat around while Terese Stokes samples some of the outside air!

walking acts. "Ground-shaking" ceremonies were capably handled by Concorde, this being its third visit to the convention.

On a slightly smaller scale (but not by much) was the thundering aerobatic display performed by Steve Wolf in his "moderately" powered (500hp!), Curtis Pitts-design, "Samson." Contrasting sharply with this was the majestic, nearly silent performance of Manfred Radius in his very slippery, high-performance sailplane soarer. The climax of his presentation was an inverted ribbon pick-up!!

"How is everything done so successfully and apparently without problems?" you ask. With a very tightly run organization and dozens of EAA members, that's how! The volunteers I met—from the flight-line patrol to the refreshment-stand staff—were courteous, helpful and friendly. The EAA information people, including Marg Ziebell, could always be counted on to supply correct answers to almost any question regarding the EAA or the convention. Special thanks, however, go out to Press Headquarters Chairperson Golda Cox and her deputy, Norma Puryear, for helping me whenever I needed it, and to John Burton, press relations chairperson, for "making things happen" with his uncanny ability to be in 10 places at once. This article wouldn't have been possible without

Below top to bottom: ■ A trio of Tango 34s on final. This great little bird is now highly prized in warbird circles. ■ If this airplane looks familiar, it should. It's a Fairchild 24W—the round-engine version of the breed. The in-line-powered variant, the 24R, has been introduced by Cox in 1/2A R/C form. (See the "Field & Bench Review" in this issue.) ■ The ever-clever "aero" mind of Burt Rutan never seems to rest. The latest is his ARES proposal for a low-cost, close, air-support airplane. Mike Melville drove it around during some impressive demos.



their help.

As with any event of this scope, you can't see it all in a few days, nor can I convey it all to you in a few pages. To absorb it all, you have to make plans to attend—once, at least; annually, if possible. I'm already getting ready for my tenth visit, and I still haven't seen it all. What can they do to top last year's show...?



Warbird Director Joe Howard brought his Cessna L-19 complete with "willy pete" (white phosphorus) for target-marking and bombs to take them out!



This T-34 in Aggressor colors and Holloman AFB markings was one of two parked in the area. Mentor has become a highly sought-after warbird (with commensurate high price tag), while similar civilian bonanzas go begging. Go figure!

FIBERGLASSING WINGS

(Continued from page 49)

accepts both polyester and epoxy resin, and how it stays put on the surface. (The fact that I really like and admire the rebellious old son-of-a-gun has absolutely nothing to do with it!)

Gathering the rest of the necessary materials is easy. You can buy throw-away brushes (sometimes called "acid brushes") and the single-edge razor blades at your hobby store. Wax-paper cups are good for mixing resin or holding acetone for cleaning up afterwards. You should buy an inexpensive pair of scissors at an office-supply store, and only use them to cut fiberglass cloth. Cutting other materials such as carbon fiber, plywood and music wire will dull them and remove the fine edge that's necessary to make clean, snag-free cuts in the cloth.

REASONS FOR RESINS

Choose the type of resin with which you'll be most comfortable working. Polyester resin cures rapidly and has a crisp surface that's easy to sand. Its primary drawback is its very offensive, harmful vapors. On the other hand, equal-mix epoxy resins offer almost the same benefits as polyester resins, but have no harmful odor. Epoxy resins do, however, have drawbacks. They take between 4 and 8 hours to cure, and they really shouldn't be sanded until they've cured for 12 hours. Another drawback of epoxy resins is that they aren't compatible with most polyester resins i.e., they won't cure over 99 percent of them. (Yes, the reverse is possible; epoxy resins will cure over polyesters.) Why is this important?—simply because if you need to make a repair, it's faster to use a polyester resin (sometimes mixed with "microballoons" as fillers) than to wait overnight for an epoxy to cure.

For this demonstration, I let my helper, Charlie Chambers, use the product with which he was the most familiar: K&B polyester resin. I chose Z-poxy* finishing resin (my personal favorite) for three reasons: it cures quickly, its equal-mix formula is odorless, and it's the only epoxy finishing resin (that I know of) that's compatible with polyester resin. The choice is yours—both products provide a smooth, crisp finish. OK, with the educational

(Continued on page 66)

duke's mixture



All Fox motors are test run before they are sold. This has the advantage of assuring you that the motor will run well, that the compression is good, and that the carburetor works properly. Very few manufacturers these days spend the time and money to do a test run. One disadvantage to test running a motor, however, is that the residual oil makes a motor feel stiff if it sets around very long. The stiffness will disappear once the motor has been choked and cranked a few times and gets some fresh fuel inside.

Our Fox Eagle 4 is our newest state of the art motor. It is an evolution of the Eagle III, which pulled so hard that it started the "long stroke" revolution. Our new Eagle 4 60 pulls harder than any other 60 that we have tested, and we have tested nearly all of them. The Eagle 60 and 74 are both ring motors. Early in 1991, we expect to offer ABC versions of both the 60 and 74, and we expect these to run even faster. You can pay twice the price of one of our Eagles, and get a motor that doesn't fly your airplane any better.

Our 45 and 50 have been around several years and have gone through several improvements. These also are as powerful as the best of our competition. If you have been flying another brand 45 or 50, and are less than totally satisfied with it, we invite you to try a Fox. I think you will be happily surprised.

Our light frame 40 is available in three variations. The lowest price 40 has a bushing main and an iron piston and steel liner. The next step up the scale has two ball bearings, and an iron piston and steel liner. The top of the line, our 40 Delux, has two ball bearings and an ABC cylinder and piston. All three motors have approximately the same 1-1/8 H.P. when running a 10-6 propeller. The Delux, by virtue of its lighter piston, runs incredibly smooth. The Fox 40 Standard and bushing motors, by virtue of their very carefully machined iron piston, still vibrate less than most of our competition.

Our Quickee 500 racing special, as far as we know, now holds the fastest heat times on both the short course and the long course. J. P. Hanway turned a 1.14.07 in a recent Dallas race. Lyn Murray, of Canada, turned a 1.31 on a long course in a Canadian race.

We also offer an older design, modestly priced 25, which, although not a state of the art motor, starts easily and has plenty of power to fly any airplane calling for a 25.

The smallest motor that we now offer is a Fox 19 ball bearing. It is a very fine little motor of schneurle, ball bearing design, and we feel performs better than most motors of its size.

I am telling you this because many people do not know what motors we make, as we are a small company and do not have the thousands of dollars to spend on advertising that some of our competitors do.

For the many of you who fly Fox motors, we want to say, "Thanks, we appreciate your business, and we will continue to give you our wholehearted support and service."

For those of you who may not have experienced the thrill of flying a Fox motor, and would like to at no risk, we make this offer:

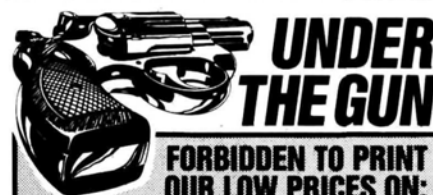
We will loan you either a Fox 40 Standard or an Eagle 60, your choice. Fly it in your own airplane. After 30 days, return the motor to us. You pay only the U.P.S. charges back. We would want your Visa or MasterCard number, which we would charge only if the motor was not returned. Can't beat a deal like that, can you?

Happy flying,

Duke Fox



Manufacturing Company
5305 Towson Avenue
Fort Smith, AR 72901
Phone (501) 646-1656



- Concept 30 Heli.
- Ryan OS Max Spec.
- TelStar 25 & 40
- All Kalt Helis.
- Diabolo 40
- Royal Air 40T

• And Much, Much More!

BUT WE CAN QUOTE THEM OVER THE PHONE!

ISLAND HOBBIES & RACEWAY HAUPPAUGE, NY
1-800-344-9225

SCALE R/C VINTAGE SAILPLANES KITS



1/6 SCALE ***124-INCH WINGSPAN ***\$205



1/5 SCALE ***111-INCH WINGSPAN ***\$230

BOTH KITS FEATURE:

- *Fiberglass fuselage
- *Built-up wing & tail
- *Pre-cut wooden parts
- *Complete hardware
- *Instruction book
- *Rolled plans

Add \$12 for shipping & handling

TRITON MODELS

Box 103 RD 1
Reading, PA 19607

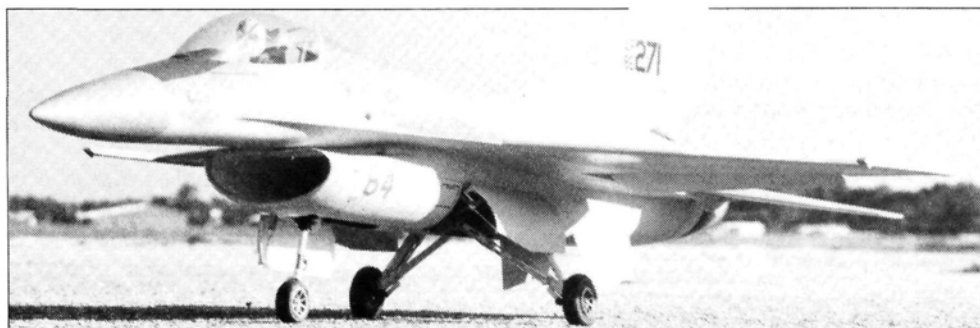
SPORTY SCALE

TECHNIQUES

by FRANK TIANO

WW I warbirds & unbeatable holiday gifts

LABOR DAY, the first day of autumn and the last days of the U.S. Scale Masters have passed. Though many of you are reading this at the beginning of winter, I'm sitting here in Florida wearing a pair of cut-offs, a sleeveless T-shirt and no shoes! For most of you, the building season is about to begin, but in the South, the flying season has finally arrived. What a country!! Because I "run" this column just like most democratic organizations, I cater to the majority. This month's entire article will be devoted to stuff that will surely make your building season brighter!



Violett's new 70-inch-long F-16 kit features scale, operating, landing gear. Owing to extensive pre-fabrication, you can build this F-16 rather quickly. Its wide speed envelope ranges from very slow to 180mph.

...PERHAPS SOMETHING NEW!

Month after month, you've requested information on scale projects other than civilian or WW II birds, and I would have provided it sooner, but I had to wait for the "majority" I mentioned!

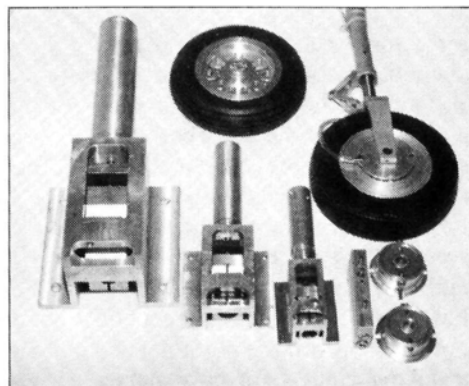
Here's the scoop: if you really have the hots for a WW I airplane, and it absolutely, positively has to be "right-on" in the outline department and fly like a homesick angel, look no further than the city of Aurora, OR, for some of the sweetest-looking, flying,

vintage biplanes you'll ever see! Aurora is home to Proctor Enterprises,* which offers four superb kits. The company's newest is of the Albatros DVa. (By now, you've probably seen the one that Dick Hansen flies; it made its debut at Top Gun 1990.)

The kit has an 89-inch wingspan and is just about 73 inches long. You can expect a finished weight of 20 pounds or so, and Dick flies the prototype with an Enya 2.40 V-Twin. With an area of 1,950 square inches, this ship is very lightly loaded and flies like a dream. I think the new O.S. 3500 would be a natural for this bird.

If the Albatros is too large for you, Proctor offers a French Nieuport 28 with a span of only 80 inches. This is the airplane that Bob Hanft has made so famous

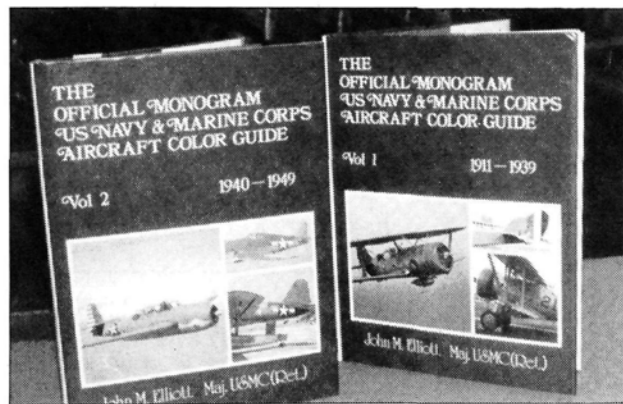
by placing it on the U.S. FAI team—twice! Now, we're talking about a finished weight of only 16 or 17 pounds and a powerplant



Custom retracts, a braking system that works and scale aluminum wheels and struts are all from Impact Engineering. The tire compounds are a great balance of durability and lightness.

such as an O.S. 108 or Tigre 2500 2-stroke engine, or a 1.20 to 1.60 4-stroke. With 1,708 square inches, it's also lightly loaded for realistic flying.

If you want to use an engine that's already hanging around your shop (in the .70 to .90 range) there's a 61-inch Nieuport 11 that flies really well and weighs only 7 or 8 pounds. If that isn't enough, what about an 87-



Monogram's "Color Guide to Navy and Marine Aircraft" is a great addition to anyone's library. It features loads of color diagrams, color photos and accurate color chips in a hardcover, 194-page format.



Finally, a medium-size Mustang! Any .90 to 1.20 will fly Bob Holman's new P-51. It uses inexpensive retracts, weighs about 14 pounds, and is available as plans or as a fiberglass semi-kit.

inch Curtiss Jenny that packs 1,450 square inches of area on an 11-pound airframe? Dick has been flying this one for years, and he performs a full aerobatic routine with it. It's one of the easiest-to-fly scale biplanes I've ever seen! Once again, a solid .80 or .90 2-stroke is all you need.

PICTURE-BOOK PERFECT!

For the building season (which just happens to coincide with the holiday season), you might consider buying Monogram's* recently released book, *The Official Monogram U.S. Navy & Marine Corps Aircraft Color Guide, Vol. 2*.

To those who already have Volume 1, I just want to say that they're as different as night and day! Volume 2 has a lot more information on WW II stuff, while Volume I features air-

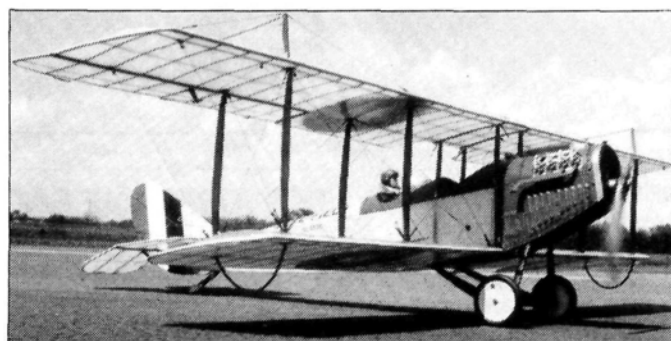
craft in service up to 1939. Both books are dandy and have a fantastic sheet of color chips bound into their rear pages. Anyone who's building a Navy airplane and *doesn't* have the appropriate volume in his shop ought to be shot from the portside catapult of the USS Independence! If you want to buy these books, check out Zenith Aviation* or Historic Aviation*. They both offer catalogues filled with reading material and aviation videotapes such as you've never seen before!

Other holiday items (for those who demand the very best) can be found in the Bob Violett Models* *Wish Book 1990-1991*. Packing a drool factor of 10, this book does a fine job of starting household arguments about what's more important: fixing that slow leak in the swimming pool, or grabbing one of the new, state-of-the-

art, F-16 kits that are selling as fast as the folks in "Fighter Town" can produce them! Just think: scale outlines, a reliable power package, a durable airframe, scale landing gear and scores of high-tech accessories for just a few bucks more than the cost of most sport jets! I've ordered mine and intend to do a full review as soon as it arrives. In the meantime, check out BV's wish book.

terrible about shipping them! Let's face it, what good is a set of scale wheels to you in February when you needed them for the Masters in September?—especially if you had a really bad break, and you don't even *have* the airplane anymore!

When I was in Dallas for the Scale Masters, Gerry Warthan of Impact showed me the company's entire line of retracting gear and scale



● Above: Who could tell from Mike Richardson's photo that this is a .80-size model? This very realistic Nieuport 11 weighs only 8 pounds.
● Below: The Nieuport 28 C-1 is a great airplane for a biplane lover's first true-scale project. It's easy to build and fly, requires little maintenance, can be disassembled in about 8 minutes and will fit into a small station wagon.



IF WISHES WERE R/C PLANES...

Speaking of wishes, Impact Engineering* has finally answered some of mine! In the past, I've mentioned several companies that make wheels, tires and retracts. Well, some of these companies have been wonderful about taking our orders for these parts, but just

wheels. The retracts come in three sizes and are virtually slop-free; the scale wheels are unlike any I've ever seen; and the rubber tires are durable and very light. Best of all, Impact's wheels have a built-in brake drum and a matching scale strut! The workmanship of the entire line is outstanding! (Similar to that offered by Gene Barton, except that

(Continued on page 101)



Here's Dick Hansen's Jenny. This Proctor prototype-kit airplane flies a very respectable AMA pattern, yet it can "win it all" at any scale contest. It's very accurate—a rigging lover's dream come true!

FOR PLANES



The only line of small vises with full "tilt, turn and rotate" control. Better than a third hand! Model 302, the PanaVise Starter Kit, has two interchangeable heads that'll help you fly right. Look for PanaVise products and accessories at your favorite hobby shop. For a free mini-catalog, send a self-addressed, stamped envelope.

...THE REST OF
US NEED A

PANAVISE®

PanaVise Products, Inc.
1485 Southern Way, Sparks, NV 89431



FIBERGLASSING WINGS

(Continued from page 63)

background and preliminaries out of the way, let's get glassing!

GLASSING

These procedures outline how to glass a wing panel, but they're exactly the same for any balsa structure. First, Charlie makes sure that the sanding block's surfaces and edges are straight and free of glue globs or any other unwanted obtrusions. Remember that this surface is the foundation of an outstanding finish and, like when building a house, it must be perfect. (See Charlie working in photo 1.) When all the block's surfaces are smooth, wipe or vacuum them, and go get your glass-cloth!

Cut a piece of cloth to fit the shape of the part you'll be glassing, but cut it approximately 2 inches larger around the entire part. Now, you can use one of two methods:

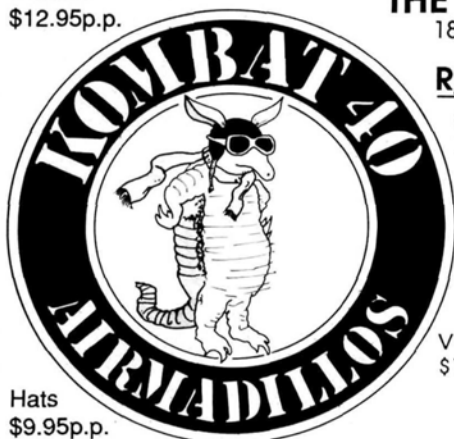
- Lay the cloth on the wing panel and gently blow on it to remove any wrinkles. Using a smooth brush, literally brush out any stubborn wrinkles. Next, mix a 1-ounce batch of either the polyester or the epoxy resin and pour little puddles of it directly onto the cloth, or brush it on. Work from the part's center toward its edges. If you pour the resin, the squeegee will spread it fabulously so that the entire surface is covered with a thin film. If you brush it on, work it out to the edges so that the cloth remains wrinkle-free. To remove excess polyester resin, squeegee it off the panel and discard it, or blot the panel's surface and gently wipe it with a strong paper towel.

If you use epoxy resin, you can pick up the excess using the squeegee and return it to the mixing cup. In both cases, leave just enough resin on the panel so there's a slight sheen when the part is held up to a light. You don't want to see heavy brush marks or ripples and ridges—just a smooth, even layer of resin over a wrinkle-free piece of fiberglass cloth. (Both methods of smoothing the cloth and removing the excess resin are shown in photos 4 and 5.)

- As an alternative to pouring the resin directly onto fiberglass cloth that's draped over the wing panel, you can brush a light coat of resin directly onto the wood, and then lay the glass-cloth onto the wet surface. Then, brush or

(Continued on page 75)

T-Shirts
\$12.95 p.p.



Hats
\$9.95 p.p.

THE AIRPLANE FACTORY, INC.

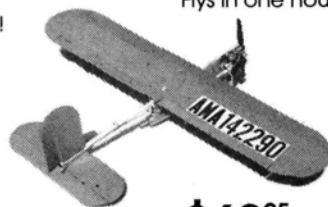
1880 PINEVIEW, MANDEVILLE, LA 70448

R/C Combat!

Crash
Resistant!

Sport Flying!

Flys in one hour!



Video
\$12.95 p.p.

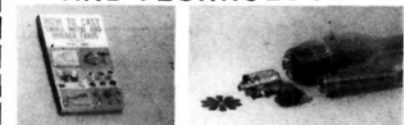
\$69⁹⁵ post paid
(LIST \$89.95)

1-800-264-7840

The "Kombat 40" is a member of the quick building, extremely durable "Armadillo" series. Made of aluminum and polypropylene (no foam) can be assembled, engine mounted and radio installed in one hour! Nothing extra to buy! You provide 4 channel radio / .25-.40 engine. We supply everything else. A great sports plane, fully aerobatic, bolt-on symmetrical wing, pre-hinged, pre-finished in red, blue, orange or yellow. When compared to other "almost ready to fly" designs that take 10-12 hours or longer to complete, the "Kombat 40" is the true winner!

ORDER YOURS TODAY! Trainer Version available \$74.95

JET ENGINES AND TECHNOLOGY



BLUE BOOK #10
Small jet engines catalog. Engines, U.S. FOX.
SPEC' sheets, plans, supplies. 25pp.....\$5.00 \$5.00
THE COMPLETE BOOK OF HOME WELDING
John Todd, 496 pp., 464 illus.....\$19.60 \$29.95
THE HOME MACHINIST'S HANDBOOK
Doug Briney, 288 pp., 278 illus.....\$16.60 \$23.95
HOW TO CAST SMALL METAL AND RUBBER PARTS
William Cannon, 176 pp., 142 illus.....\$9.70 \$13.95
JETS
Jet builder's monthly newsletter.
Engineering, construction, shows.....\$12/YR \$15/YR
DOYLEJET
P.O. BOX 60311-A, HOUSTON, TEXAS 77205
(713) 440-4744

IMPORTED DIESEL ENGINES

Current production: Aurora, D-C, Enya, FIT, KMD, MAP, MIKRO, MK, MVVS, PAW, Pfeffer, Silver Swallow and USE Diesels. Also Mills and DYNO replica diesels and some very special imported glow engines and CO₂ motors. 10-page catalog \$1.

CARLSON ENGINE IMPORTS

814 East Marconi, Phoenix, AZ 85022



PHOTOS BY FRANK GUDAITIS

FIFTY-EIGHT YEARS ago, most model airplanes were gliders or powered by rubber bands that turned balsa propellers; the first single-cylinder miniature gas engines were just starting to appear. At the 1933 Nationals, only one gas model competed against the rubber-powered planes, but it won first place in three events! It was constructed by an 18-year-old from Philadelphia named Maxwell Bassett.

That year, *Model Airplane News* Editor Charles Hampson Grant summoned another top-notch young model builder—Joseph Kovel—to his office, and asked him if he would be interested in building a gas model if he (Grant) provided the engine.

Joe Kovel's love of model building dated back to 1927, when he first made a stand-off-scale version of Lindberg's Spirit of St. Louis. He made many other models during the next few years and won the 1932 Nationals in Atlantic City. His impressive indoor flight of 13 minutes, 3 seconds with a paper-covered model brought him to the attention of Charles Grant.

Grant was an aeronautical engineer who had designed full-size flying machines. He had also invented the multiple-section wing

PIONEERING

JOE KOVEL'S

KG

by FRANK GUDAITIS



Joe holds a Forster 99 engine, and the plane is powered by a Brown Jr. (Modular engine mount.)

flap and the variable-camber wing. Early gas models weren't very stable in flight, and Grant knew that an inherently stable free-flight airplane was essential to the success of this new form of miniature aircraft flying.

Grant drew the original design for the KG (Kovel-Grant) on heavy, brown wrapping paper, and Kovel completed the craft in just three weeks! It was finished on the morning of the first day of the 1934 Nationals, which were held at Roosevelt Field on Long Island, NY. Kovel

The model that introduced the era of gas power flies again!

and his rubber-powered models made it to the contest by public transportation; Grant had the KG delivered to the field late that afternoon.

ENGINE PROBLEMS STYMIE FIRST FLIGHT

The KG was powered by a Gil engine—a heavy clunker originally intended for miniature model boats. Although Grant and Kovel tried their best, they couldn't get it to run. Once again, Maxwell Bassett won three events; his airplane

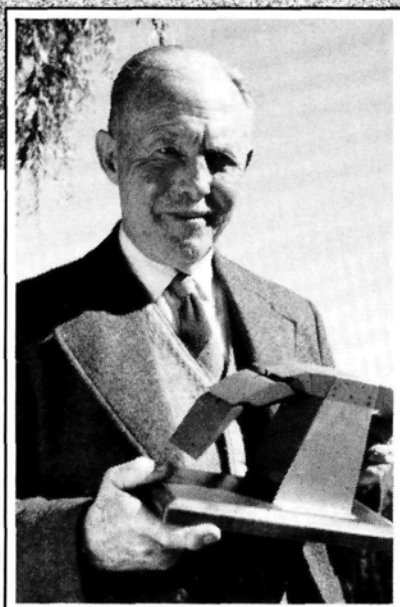
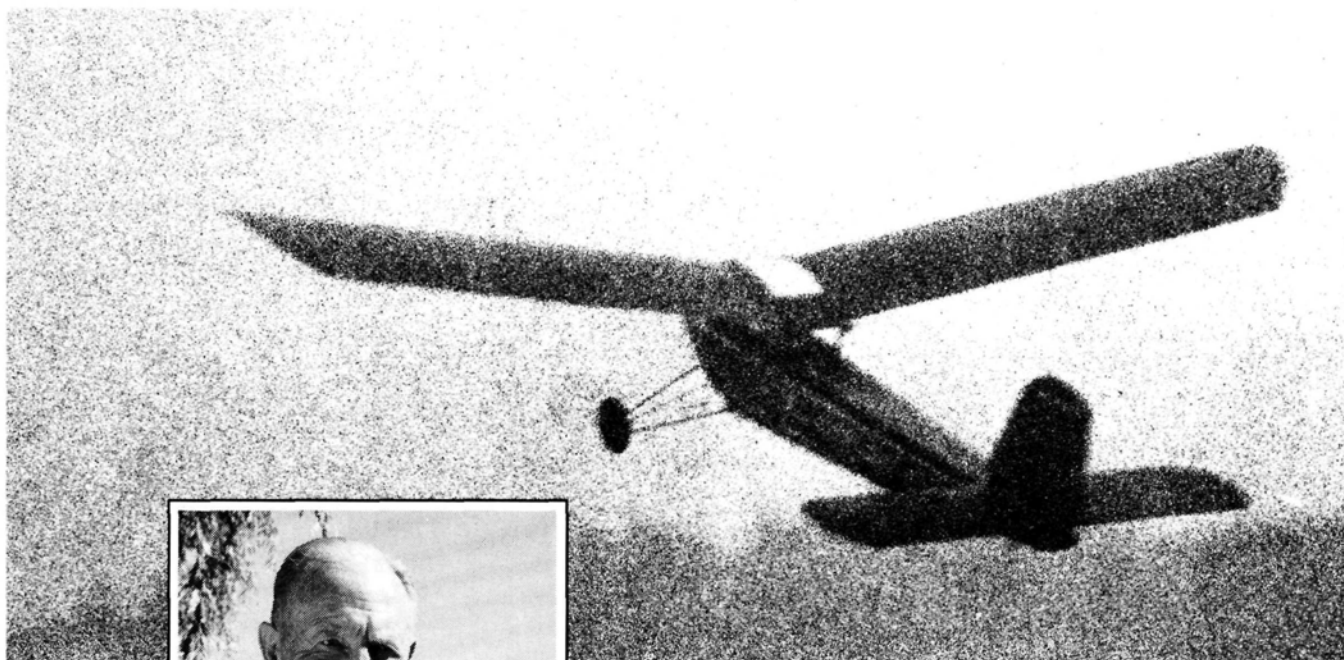
wasn't very stable, but it was powered by an early Brown Jr. engine.

Charles Grant soon ordered one of these engines from Bill Brown, who traveled to Grant's home in Peru, VT, to help him install and run the new powerplant. The dependable, high-quality Brown Jr. probably contributed more to the success of this new form of mod-

sary. Grant hand-launched the plane over a field of 3-foot grass, and its first three flights were all the same: the model climbed to roughly 50 feet and then made a shallow banking spiral to the ground! It was obvious that some changes were needed. While Grant thought about it, Kovel and Brown hand-carved new wooden



Joe Kovel at age 19 with KG model under construction (circa 1934).



See MAN's May '87 issue for an article about the life of Charles Grant, who is generally regarded as the father of model aviation in this country.

eling than any other engine of its time.

Kovel was also there to make any construction changes the flight tests showed were neces-

props to replace the ones that had been broken in the test flights. Grant was convinced that raising the wing 3 inches above the fuselage would solve the plane's problems.

Kovel constructed a new wing mount according to Grant's instructions, and the flight tests were resumed. This time, when Grant ran with the KG and hand-launched it, Kovel remembers, "It went into a beautiful climbing,

turn." This first successful flight lasted 14 minutes! Grant later found the plane on the ground in the middle of a forest, right-side-up and undamaged.

Finally, they had a gas-powered model airplane that was inherently stable in all three flight axes, both with power on and power off! The first KG had a wingspan of 8 feet. Seeking additional lift and better soaring characteristics, Grant increased it to 10 feet, and the new version was designated the KG-2. The following year, at the Eastern States Contest at Hadley Field, NJ, the KG-2 made a record flight of 64 minutes, 40 seconds, and it climbed to approximately 3,000 feet!

The first KG being flight-tested in Vermont. "Model Airplane News" is inscribed on the side of its fuselage.

JOE KOVEL'S KG

Kovel and Grant had perfected a form of miniature-aircraft flying, the future size and scope of which they never could have imagined. In 1934, seven gas models appeared at the Nationals in Akron, OH. Joe Kovel and his KG placed 2nd with a flight of 14 minutes, 2 seconds. The next year, four times as many gas models showed up!

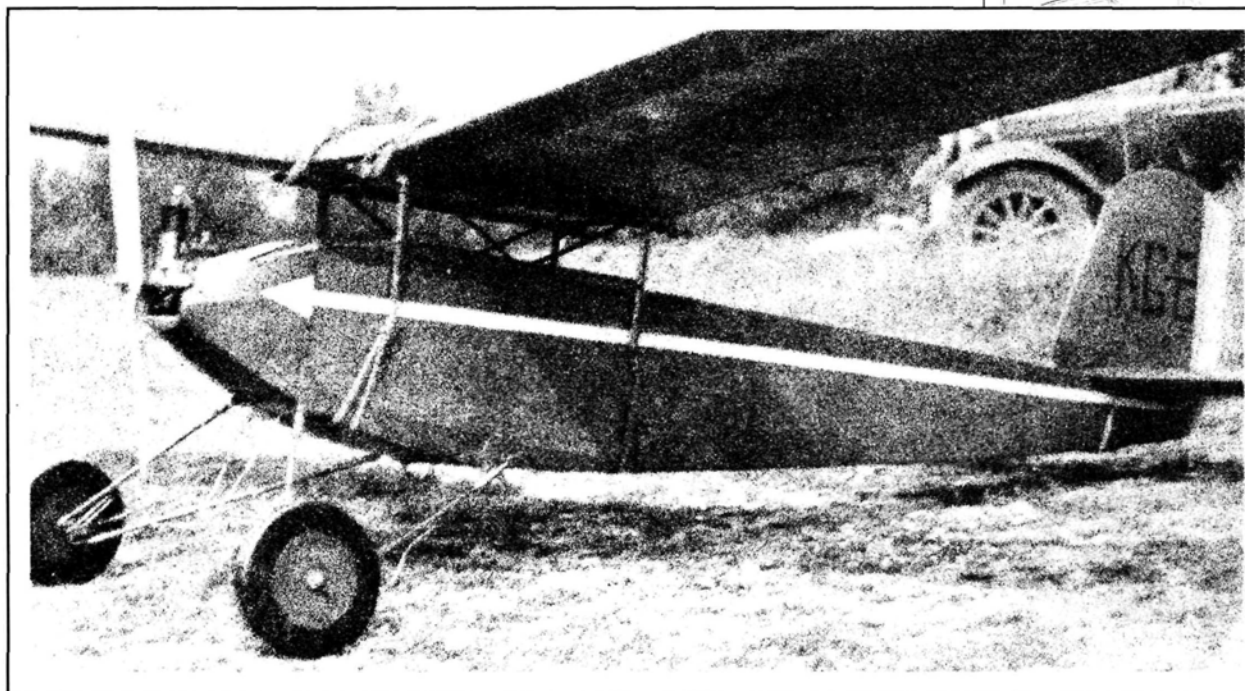
WORD GETS OUT!

In April and May of 1935, *Model Airplane News* published detailed KG construction drawings, which were really reproductions of neat, ink, line drawings made by Joe Kovel. As a result, model builders throughout the world discovered this valuable design, and KG airplanes soon filled the skies!



flying! Walter Good, pioneer champion of R/C, used a slightly modified version of the KG to carry the radio equipment with which he had previously won the

VA, and a replica can be found at the Air and Space Museum in San Diego, CA.

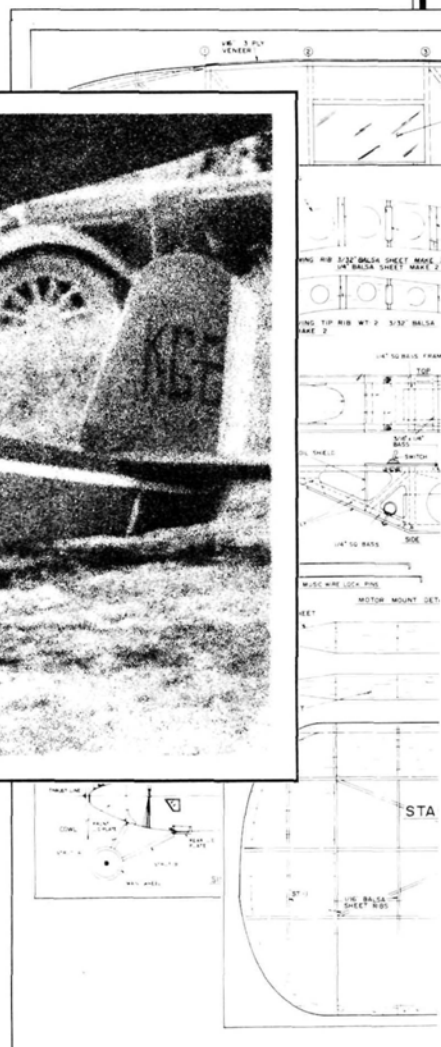


KG-2 model with Brown Jr. engine (circa 1934).

In Australia, seven builders made KGs, but they had only one Brown Jr. engine between them. Charles Grant's removable engine-pod design enabled them to move the engine from one plane to another and then take turns

Nationals.

The KG's success inspired countless young men to design and build gas-engine-powered miniature airplanes. Today, the original plane is proudly displayed in the AMA museum in Reston,



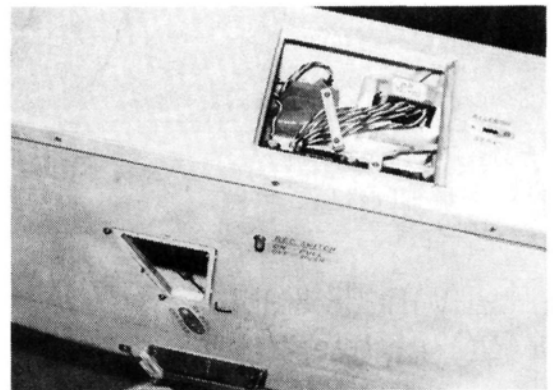
Kovel and Grant had perfected a form of miniature-aircraft flying, the future size and scope of which they never could have imagined.

The KG-2 that's shown with Kovel on these pages is a copy he built more than half a century later. Identical to the original, it even has scratch-built wheels and interchangeable engine-mount assemblies. Kovel has made three engine-mount configurations: one for the original Brown Jr. engine, another with a Forster 99 ignition engine, and a third with a 4-stroke O.S. Max 90 engine (for flexible throttle control when flying R/C). The fuselage now holds a Futaba radio that controls the rudder, elevators, ailerons and engine speed. Although the original was a super-light 7 pounds, the new KG-2

weighs 11½ pounds.

Unlike today's free-flight models, the KG has a smooth flight pattern with a slowly spiraling climb that's similar to that of full-size aircraft. The fuel tank holds 6 ounces, which is enough to last approximately 15 minutes, or a lot longer, if the engine is throttled back. The new KG-2 first flew on August 9, 1988 at Floyd Bennett field in Brooklyn, NY. Two more flights were made with an O.S. engine, and more were planned (the Brown Jr. and Forster 99 would supply the power).

Early this year (1990), in recognition of his significant contri-



butions to model aviation, the Society of Antique Modelers elected Joe Kovel to its Hall of Fame.

R/C receiver in the KG-2 built by Joe Kovel during the mid to late '80s.

**ORDER THE
FULL-SIZE
PLANS...PAGE120**

FSP04351 THE KG \$22.50

One of the first, inherently stable, gas-powered model airplanes, the historic KG was key in the development of gas-powered aeromodeling. In the 1934 Nats, the 8-foot-span original

took 2nd with a flight of 14 minutes, 2 seconds, and in 1935, the 10-foot-span KG-2 made a record flight of 64 minutes, 40 seconds. See the reprints of April, May and June '35 issues of MAN for complete assembly instructions. For advanced builders. Two full-size sheets. WS: 8 or 10 feet; L: 59"; Engine: 4-stroke .90 recommended for R/C; 4 channels. LD:3.

MODEL AIRPLANE NEWS
K-G ORIGINAL MODEL BY JOSEPH KOVEL
 PUBLISHED IN MAN APRIL & MAY, 1935
 ORIGINAL DRAWING BY JOSEPH KOVEL
 FULL SIZE DRAWING BY JOE DEMARCO
 ALL RIGHTS RESERVED FSP 04351

GOLDEN AGE

SPECIAL: SELINGSGROVE RE-ENACTMENT

by HAL deBOLT

Early models and R/C pioneers recreate a 1950's fun fly.

"SELINGSGROVE this year has to be the highlight of my modeling experiences. Sitting...at the flight line, looking...at all the OT R/Cs, it was hard to believe this was 1990, not the '50s!"—Lynn Fondott of Boyertown, PA, describes the mood of those lucky enough to attend the 1990 Selingsgrove re-enactment held during Labor Day weekend. Deemed a huge success, I'm indebted to Lynn and another OTer—Carl Schmaedig of Port Orange, FL—for their reports. Both had attended Selingsgrove back in the '50s, and they were pleased that so many attended this well-organized event.

I can now tell you how



Bob and Dolly Wischer prepare Bob's Nats-winning Pacer for a flight. In the background: Wischer "Sues," an Orion, a Taurus, a Lanzo '37 Champ and a Live Wire.



First-day Selingsgrove flight line at the modernized Penn Valley Airport. Note the Super Buccaneer and Live Wire at the head of the line.

the original fun fly started, because Fred Collins of Pittsburgh, PA, wrote to fill the gaps in my recent Selingsgrove story. Fred tells us that the idea originated with the Pittsburgh Flying Circuits—one of the first all-R/C clubs. Along with other club members, Bud and Jim Schenck were having great times with their single-channel Rudder Bugs and keeping in close touch with other early R/Cers in New Jersey and D.C. Then Bud was transferred to Selingsgrove, where he found a little-used, grass, airport runway—ideal for R/C flying!

Lonesome in Selingsgrove, Bud and his wife in-

vited brother Jim and other interested Flying Circuits members to come over on Labor Day weekend for a get-together and some flying. Member Lou Errington suggested that they invite the Jersey and D.C. groups, too, as Selingsgrove wasn't far from them, and what started as a family get-together mushroomed into an R/C gathering of 50 fliers! The rest is history....

SELINGSGROVE SURVIVES!

The leader of our Vintage R/C Society, John Worth, asked members to suggest objectives for the organization, and they gave "activities" a high priority. An annual gathering seemed a good way to start, but how? It wasn't long before someone suggested another Selingsgrove, but 40 years later, this would be easier said than done!

John checked the possibility with the locals—the Susquehanna R/C Club—and found a leader in OTer Bob Bingaman, who

quickly enlisted the cooperation of area officials and airport management. The show was on the road!

During 40 years, the area has obviously changed: the lonely diner now has restaurant competition, and the airport has nice, paved runways, hangars, etc., that exactly met the needs of the organizers.

If this was to be a re-enactment, the flight schedule would have to be the same as in the '50s, and that would mean informal flights with authentic planes and controls. The result was that, despite modern radio systems, rudder-only still relied on a hope and prayer. "Intermediate-Class II," or single-channel multi-controls, were



Carl Schmaedig prepares his Rudder Bug for flight. Just as in the '50s, it was flown rudder-only with escapements.

also flown, so the sights were very different from today's flight scene!

The frequency and flight-line controls ran smoothly, and fliers had all the air time they wanted. Those who went to fly, flew, and that's what makes a fine event.

THE MODELS

There were some signs of modernity—several Live
(Continued on page 76)

FIBERGLASSING WINGS

(Continued from page 66)

squeegee the wrinkles away (again, start at the part's center and work outward).

There aren't any advantages or disadvantages to either method—both work well. The important thing is to get enough resin through the weave of the cloth to hold it securely in place, but not so much resin that sanding is difficult later.

Some modelers wait until this coat of resin has cured enough to permit handling before they remove the border of excess cloth; others wait for a partial cure and then glass the other side. Charlie chose the latter. He glassed one side of all the flying surfaces of the two Bob Violet* Aggressors in about 90 minutes, and he put them outside in the sun to cure. When they had cured enough to handle, he glassed the other side of each surface and put them back outside. After a couple of hours, he trimmed off the excess cloth with an old pair of scissors and gently sanded the edges with a long sanding block and 220-grit wet/dry sandpaper.

After both sides of a panel have been glassed and trimmed, you might need to apply a second, light coat of resin. Take a good look at the part and see if the glass-cloth's weave is easy to see. If it is, you probably need another coat. If you used the polyester resin, lightly sand the first coat with 320-grit sandpaper, just scuffing the surface gently. Then, brush on a second coat of resin with a good-quality soft brush, using just enough to fill the weave. (You don't want any brush strokes cured into the surface.)

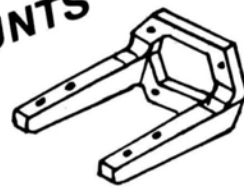
If you use the epoxy resin, you won't have to sand the first coat before applying the second. (Again, apply a very thin coat of resin.) In either case, the finished structure will be a lot easier to sand if you let the resin cure for a while.

SURE SANDING

Resins continue to shrink for many days, and they acquire a crisper finish with time. So, if your schedule permits, wait at least 24 to 48 hours, and then sand the resin's glossy finish using the sanding block and, initially, about an 80-grit sandpaper. (Use this grit to break through the glossy surface; when the gloss has been cut, replace the 80-grit sandpaper with some 180-grit stuff, and sand the surface until it's smooth.) If you were

(Continued on page 78)

IT'S for precision Aluminum MOTOR MOUNTS



FOUR CYCLE

Alloy Alluminum Machined Beams		Drilled & Tapped 90° Thrust Line	
O.S.		ENYA	
FS-20	\$7.50	35/40-4C	\$8.95
FS-40/40S	8.95	46-4C	8.95
FS-48	9.95	60/80/90/	
FS-60/75/90	12.95	120-4C	12.95
FS-61	12.95	120-4C	21.50
FS-120/120S	19.95		
HP		SAITO	
VT-21	\$7.50	FA 40/45	\$8.95
VT-49	8.95	FA 65	12.95
		FA 120	19.95
WEBRA		Undrilled	
T4-40	\$8.95	60-90	\$11.25
TA-60/80	12.95		

If not available from your hobby shop, ORDER DIRECT. Check, MO, VISA, MC or COD accepted. Add \$2.50 for S&H, 2.00 for COD. California residents add 6 1/2% sales tax.

TWO CYCLE

Machined Beams Engine Mounting Bolts Incl.	
1/2 A Sh Bm	\$3.90
1/2 A Lg Bm	4.10
.09	4.75
.15 Lg Bm	4.95
.19-35CC	5.85
.29-40 Lg Bm	6.80
.40-61 Sh Bm	6.50
.40 RV Pylon	7.75
.60 Pattern	10.25

GIANT SCALE

Alloy Alluminum Machined Beams Engine Mounting Screws Incl.	
OS Max 90	\$19.25
OS Max 1.08	19.95
Super Tigre-2000,	
2500 & 3000	19.95
Zenoah G-38	19.95
Quadra	
35/40	21.50

C.B. / TATONE, INC.

21658 Cloud Way • Hayward, CA 94545
In CA 415-783-4868 • Out CA 800-482-8663

CAREER OPPORTUNITY in R/C MODEL AIRPLANES

Great Planes Model Mfg. R&D has an immediate opening for a "Graphics Coordinator." This is a challenging opportunity to work in a field you really enjoy, for a rapidly growing company that is at the leading edge of R/C model technology.

Duties will include: Box label design; Instruction book typesetting and paste-up; Proofreading; Procuring all printed materials; Monitoring and maintaining stock levels of printed materials; Creation of bills of materials; Answering modelers' technical questions; assisting in the design and development of new models; and other misc. responsibilities.

Successful applicant must be:

1. A competent R/C model airplane builder and pilot, having at least 5 years of experience with high performance aerobatic or scale models (beyond the "trainer" level).
2. Skilled in the graphic arts, including: graphics design with ability to make thumbnail sketches of concepts; typesetting; paste-up; preparing camera-ready graphics for printing.
3. Thoroughly familiar with the many aspects of B&W and color printing processes.

Other helpful (but not required) experience: Mechanical drafting; Use of personal computer for word processing, desktop publishing and drafting.

Starting salary: \$16,000 to \$20,000, depending on qualifications.

To apply for this position, submit a resume' including: Name, Address, Phone, Complete work and hobby history, List of qualifications, and Samples which demonstrate your graphics skills.

Send to: Great Planes Model Mfg.
Attn: R&D Manager
P.O. Box 788
Urbana, IL 61801



ELECTRONIC SPEED CONTROL

3 SPEED ADJUSTABLE - OFF, LOW (ADJUSTABLE), FULL.

NEW!



ESC-3 \$34.95
AVAILABLE IN BLACK OR WHITE

YOUNG ENGINEERING
710 Silver Spur Rd. #181
Rolling Hills Est., CA 90274

- SIZE: 1"x 2"x 0.75"
- WEIGHT: 1.2 oz.
- INPUT POWER: 6-26 cells
- CONT. CURRENT: 76 amps
- PEAK CURRENT: 225amps
- ELIMINATES RECEIVER PACK
- IDEAL FOR R/C ELECTRIC AIRCRAFT
- SATISFACTION GUARANTEED

INCLUDE \$2.00 FOR SHIPPING
CA RESIDENTS ADD SALES TAX

GOLDEN AGE OF R/C



Inventor of TTPW, Dr. Good examines Al Diem's replica Rudder Bug and TTPW, which were built especially for Selinsgrove.

Wire (LW) designs used electric power. They ranged from trainers to Champs, and

there was even a Custom biplane, which is a *big* one! Electric power and OT R/C seem to be a good combo. Which models showed up?

● **Rudder only:** Rudder Bugs, a Milt Boone Charger, an Aero 15, several LW Champs and a Rebel.

● **Intermediate:** an Aristo Cat, a Mac 17 and a couple of Wischer Sues.

● **Multi:** an Orion, several Tauruses, an LW Cruiser, a PT-19, an Astro Hog and an early Phoenix 3.

This was a good assortment, and Lynn says there were probably others that he has forgotten.

SELINGSGROVE CELEBRITIES!

Carl Schmaedig was the banquet MC, and he kept

the festivities moving along hilariously. There was a serious side, too: Carl asked whether all were aware that they were in the company of the "royalty of R/C." When was the last time *you* sat with a gathering of the "gods" such these?:

Walter Good, John Worth, Maynard Hill, Don Lowe, Jimmy Greer, Bill Northrup, Al Diem, Frank

NUMBER-ONE CHAMP



The first R/C World Champ—Kazmirski—watches as Lynn Fondott checks his Orion for takeoff. The scene is very reminiscent of the '60 Zurich meet.

won the World Champs in Zurich, Switzerland, in 1960; and Lynn Fondott made sure that it was represented at Selinsgrove. Deciding that its win qualified it as an OTer of the VR/CS "vintage" era, he built his replica and has been flying it for a couple of years. Best of all, he finally met Ed at Selinsgrove! (Seeing Lynn's replica brought back many memories for Ed.)

Lynn's Orion is a docile multi that fits the modern scene remarkably well. Perhaps a few details about it will entice you to build it.

In 1959, Kazmirski, Bob Dunham and I were chosen to be the '60 FAI World Champ team, so we had almost a year to prepare for the event. It was a time of momentous changes in pattern design: high-wings and bipes predominated, but the Astro Hog showed the great potential of low-wings.

Bob had the most experience with Hogs, and his mods had improved it nicely. From this, he realized what he had to do to make an even better low-wing, and he got together with Bud Hartranft on a design they labeled the "Volvswagon" (actually the forerunner of today's pattern birds). It performed so well that Bob chose it for the World Champs.

Ed Kazmirski was a dyed-in-the-wool Orbit man and, as such, he kept in close touch with Bob, whose adoration of the Voltswagon impressed him. Using the proven parameters Bob had uncovered, Ed developed his own version—the Orion, of course. As well as becoming World Champ, it was offered as a kit by Top Flight.

As the three-view shows, by today's standards, the Orion's design was simple and needed little more than a good .40 to reach its potential. It was written about in *Model Airplane News*, June, '60. Tom Dixon, 1938 Peachtree Rd., Atlanta, GA 30309, has Orion plans. Don't you feel tempted?

SPECIFICATIONS

Wingspan: 68 inches

Area: 705 square inches

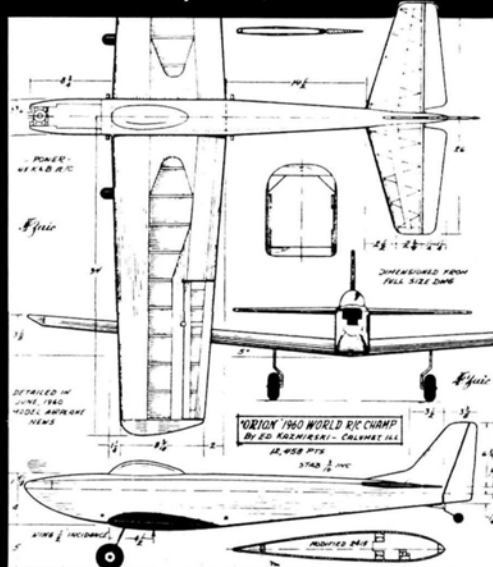
Weight: 6 pounds

Power: K&B .45

Radio: Orbit 8-channel "relay-less" reeds

"BIG" ED KAZMIRSKI'S "Orion" became

the first R/C world champion when Ed



World Champion Orion three-view.



Pioneers attended Selinsgrove '90 in abundance. Here are Sara and Bud Schenck, who initiated the original meet. Good R/C and Bill Northrup world records!

Garcher, Hal Parenti, Leon Shulman and "Champ of Champs," Ed Kazmirski. Some of those who are no longer with us may have been looking down approvingly: Lou Errington, Howard McEntee and Jim Walker perhaps?

Even though the original event offered winners only a pat on the back, in 1990, there were awards, which, in keeping with the theme, were associated with the original intent of the gathering.

The efforts of Bob Bingaman, the Susquehanna Club and the airport management were honored with special plaques.

The "Tinkers Delight" award went to Al Diem, whose efforts to suit the theme of the affair went above and beyond. An electronics wizard, Al was deep into TTPW (two-tone pulse width) at the early meetings. One year, he practically demolished his "Bug" on the first day, but he spent an entire night rebuilding it so that he could try again the next day. He said that only the latest in adhesives made it possible—the new "5-minute epoxy"!

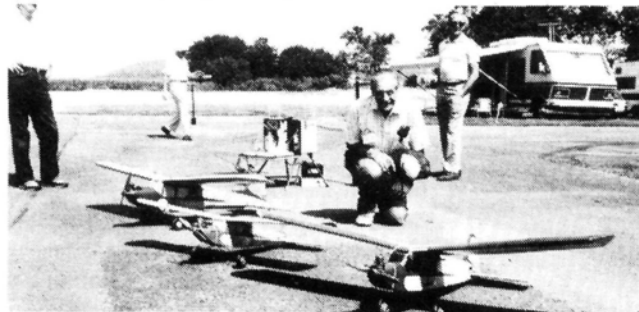
For the re-enactment, Al took on the chore of recreating his original Rudder Bug, complete with an authentic TTPW! Then he carried it all the way from Utah. Unfortunately, he ran out of time, so it wasn't flight-ready, but when he finds the ancient components he needs, he'll be ready for takeoff. (He just hopes he can

find them.)

The "Outstanding Achievement" award went to Bob Wischer, who took along his son Bill's *original* Nats-winning, single-channel, multi-control "Sue" and flew it just as Bill had when he won Intermediate at the '60, '61 and '62 Nats. The Wischers also had a second *original* Sue that was rudder only. (The Sue configuration is an attractive candidate for modern OT R/C.)

The "Best of the Way it Was" award went to Selinsgrove founder Bud Schenck, who may be setting some sort of record. In 1957, Bud built an LW Champion, and he powered it with a Fox engine. Would you believe the Champ has been flying ever since? During its 2,400 flights, Bud has accumulated more than 300 hours of flight time—all with the original Fox engine!

There was good news, too, about the VR/CS: John reported that membership is now close to 300 (and growing steadily), finances are stable and, thanks to the efforts of Editor Art Schroeder, the newsletter will be expanded. What else can be said? The re-enactment closed on an upbeat note; pioneers enjoyed doing their thing and meeting one another again; newcomers had the chance to see early-bird flying and meet some great people. Do it again next year? You bet! Selinsgrove '90 was so well accepted that we've been invited back! ■



Talk about longevity!—Mike Granieri displayed three of his 40-year-old R/Cs, which all flew at early Selinsgrove meets!

Reach for **robart**



ROBART HINGE POINTS AND CONTROL HORNS...

The best ways to keep your cool and maintain control.

ROBART HINGE POINTS.

Simply the best hinging system available for any application. Drill a hole, add a drop of glue and the Hinge Point and you're hinged!



ROBART CONTROL HORNS.

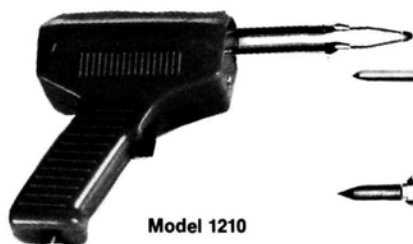
For the most accurate, on-center control of your linkage. No need for bent or kinked control lines when you use these horns with their built-in rotating ball link.

Reach for these and other fine ROBART products at hobby dealers nationwide.

ROBART MFG.
P.O. BOX 1247
ST. CHARLES, IL 60174
708-584-7616

K&S Engineering
6917 W. 59th St.
Chicago, IL 60638

Soldering Tools



Model 1210



Model 910



Model 300



Model 212

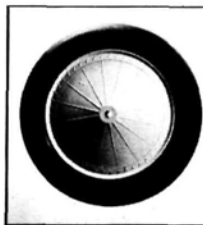
- ★ Model 212 — Pencil type iron gives 30 watts capacity of fast heat for field repairs using a 12 volt battery for power.
- ★ Model 300 — Iron gives you 30 watts capacity, is light weight, pencil type iron.
- ★ Model 910 — Iron has a capacity of 60 watts, heavy duty iron.
- ★ Model 1210 — Gun provides 100 watts capacity, heats instantly.

Send \$1.00 for catalog and prices. — Telephone: 312/586-8503



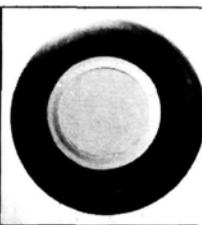
SCALE WHEELS

RADIO CONTROL • CONTROL-LINE • FREE-FLIGHT



VINTAGE

sizes: 2 1/2"
1 1/2" 3 1/8"
1 7/8" 3 3/4"
4 3/8"
5"
6 5/8"



SMOOTH CONTOUR

3/4" 2 3/4"
1" 3 1/4"
1 1/4" 3 3/4"
1 1/2" 4 1/2"
2 1/4" 5 1/4"



GOLDEN AGE

sizes: 2 1/2"
1 1/2" 3 1/8"
1 7/8" 3 3/4"
4 3/8"
5"
6 1/2"



BALLOON

2 1/2" 4 1/2"
3 1/4" 5 1/4"
3 3/4"

SCALE PILOTS • CYLINDERS • ENGINE KITS
MACHINE GUN KITS • PLASTIC DISPLAY MODELS



SEND \$3 FOR COMPLETE COLOR CATALOG

DEPT. MAN • 181 PAWNEE ST., SAN MARCOS, CA. • 92069

FIBERGLASSING WINGS

(Continued from page 75)

neat, careful and avoided making heavy brush marks earlier, your sanding chore will be much easier. If, however, you were sloppy (i.e., you didn't squeegee or blot up the excess resin) and there are ridges cured into the surface, you're probably cursing your head off and blaming me for a lousy procedure!

You'll find that both types of resin are easy to sand. The polyester type has a surface glaze that's a little tougher to break, and it occasionally develops little pinholes. A little elbow grease and some good sanding blocks make all the difference in the world!

For those who like to hand- or palm-sand (hold a folded piece of sandpaper in their hand), *forget it!* For good results, you *must* use a sanding block! This is one of the secrets of successful glassing. If you don't block-sand, you'll find many little shiny spots all over your work. These are low areas, and you'll make them if you hand-hold the sandpaper. If this happens, you'll have to put on still *another* coat of resin and start sanding all over again! So please, use the sanding block!

FILL IN THE GAPS

When all the parts have been sanded, wipe them down with some denatured alcohol. Check for any building imperfections, and fill the dents, gouges, or tears with a mixture of resin and microballoons made into a thick paste. Squeegee the mixture over the imperfections and allow it to cure. After this mixture has cured, block-sand it smooth until it matches and flows with the contour of the surrounding area.

That's it! You've finished! You now have perfectly glassed parts that are protected from minor hangar rash, general bashing around and more than an occasional rough landing. You now have sealed surfaces that are impervious to oil and dirt and that won't crack under slight vibrations. Best of all, you now have the best foundation for paint that anyone could ask for. If you've done the work properly, you've only added a few ounces to a normal 60- or 70-inch airplane. If you still need reassurance, try to push your fingernail gently into the new, glassed surface. You'll be happy to see that you can't. Now try it on an airframe covered with a *plastic* film!

(Continued on page 101)

TRI-CITY SOARERS AND COLUMBIA CUP SLOPE SOARERS RACE!!!

Minimum \$2,000.00 cash
purse, trophies, & prizes!!!

PRE-REGISTRATION ONLY

ENTRY FEE \$80 U.S.

Space limited to first 50 applicants

For info., Contact Wil @ (509) 627-5224
TRI-CITY SOARERS, Rt. 4 Box 9544, Richland, WA 99352

Wingspan 92 in.
Wing Area 1420 sq. in.
Length Overall 74.25 in.
Weight 18-24 lbs.
Engine . Quadra Q-35, Q-40, similar
All-wood construction; no foam used. Cowl,
canopy & spinner available.

HAWKSEA HURRICANE



Hawker
Sea Fury

Wingspan 92 in.
Wing Area .. 1760 sq. in.
Length Overall 78 in.
Weight 26 - 32 lbs.
Engine ... 2.4 - 3.7 cu. in.
Available in razorback or bubble.

Wingspan 90 in.
Wing Area ... 1800 sq. in.
Length Overall 81 in.
Weight 28-32 lbs.
Engine ... 3.4 - 4.2 cu. in.
All-wood construction... no
foam used. Cowl, canopy &
spinner available.

P-47



Please write for more information:

Roy Vaillancourt
18 Oakdale Avenue
Farmingville, NY 11738

(516) 732-4715 after 6:30 Eastern time.



The F-24's first flight took place during the early evening hours when the wind was almost non-existent. A gentle shove was all that was required.



- This new ARF will
- reacquaint you with
- the fun of 1/2A scale



The little bird on a flyby. The trailing white wire is the receiver antenna; don't "trim to fit"!

SPECIFICATIONS

Type: Sport scale, 1/2A ARF

Wingspan: 38 inches

Weight: 26.25 ounces, ready-to-fly

Wing Area: 251 square inches

Wing Loading: 15 ounces per square foot

Power Req'd: Cox .049 Ranger (supplied)

No. of Channels Req'd: 2 (rudder and elevator)

Sug. Retail Price: \$202.95

Features: Blow-molded fuselage with color built in; molded hollow-foam wing and molded tail group. Ranger .049 engine is equipped with a

spring starter and a variable-outlet muffler. Highly prefabricated; no adhesives required for assembly.

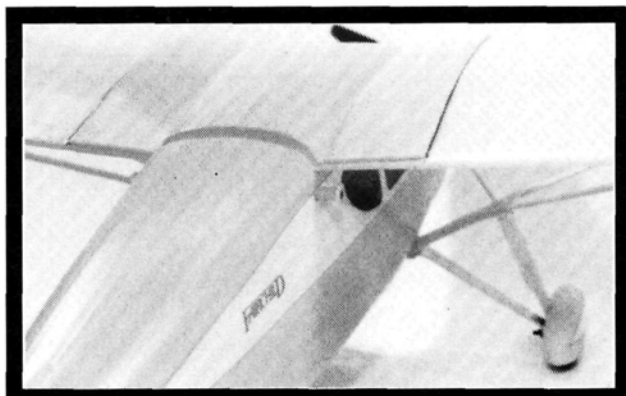
Comments: This little scale 1/2A airplane is a great change of pace for intermediate fliers. It provides the opportunity to rediscover just how much fun small R/C can be.

FAIRCHILD 24 A R F

THERE'S NO DOUBT about it, folks: "small R/C" is enjoying a resurgence in popularity, and it has been brought about, in part, by the incredible, shrinking-flying-field syndrome. Randy Randolph and Joe Wagner have been telling us this for years in MAN's "Small Steps" column, and I bet if you look around the flight line, you'll see more small flying machines than ever before. Perhaps those who usually fly the .40- to .60-powered machines have discovered that small airplanes can be an inexpensive way to have a lot of fun.

Sitting on the runway, the 1/2A Fairchild looks quite realistic. Cox Hobbies has done an excellent job of miniaturizing the original.





If this new interest on the part of modelers qualifies as enlightened thinking, Cox Hobbies* can take a lot of the credit as the source of inspiration. It has been producing 1/2A engines for eons—everything from the sport type to the high-performance TeeDee, plus versions tailored to specific events, e.g., the 1/2A Texaco. With engine-production capability well in hand, it seems logical that Cox would look at the R/C airplane market, decide it could offer a “home” for at least some of its engines and set out to produce some airframes.

The newest offering, and the subject of this review, is the Fairchild 24. It's difficult to determine why Cox chose this particular subject because, although the F-24 is truly a classic airplane and one of my favorites, its chunky, hump-backed appearance may not have endeared itself to modelers as much as, say, an early Cessna or Aeronca Champ. I guess since Cox has a Cub of a similar size on the way, the

F-24 got the nod as something that looked a little more “sophisticated” than the flat-sided Piper. In any case, the F-24 comes off extremely well, both in appearance and execution.

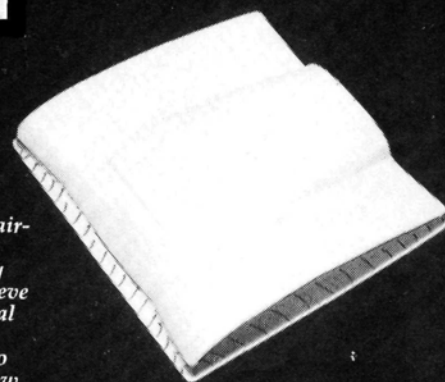
GETTING IT TOGETHER

The Fairchild's assembly is thoroughly described in a multipage instruction sheet that uses line drawings rather than photographs to describe the building sequence. There are some minor hardware labeling inaccuracies, but they won't cause any real problems.

The Fairchild qualifies as an ARF (almost-ready-to-fly), and it requires little in the way of building skills to

■ Above left: The over-wing fairing, as supplied. The cross-hatched area is to be cut away with an X-Acto knife. To achieve a proper fit, trim the additional material as necessary

■ Right: The first trimming (to the scribed line) wouldn't allow the formed plastic fairing to match the fuselage contour. It fit nicely after additional plastic had been removed.



complete. Its fuselage—a “blow-molded” plastic with a bright yellow finish—is durable, flexible and 100-percent fuelproof. Unlike some other kits that use this type of material and manufacturing technique, the Fairchild is relatively light. Its wings are made of hollow-molded foam (yes, there *is* a real airfoil there!), and they're finished to match the fuselage.

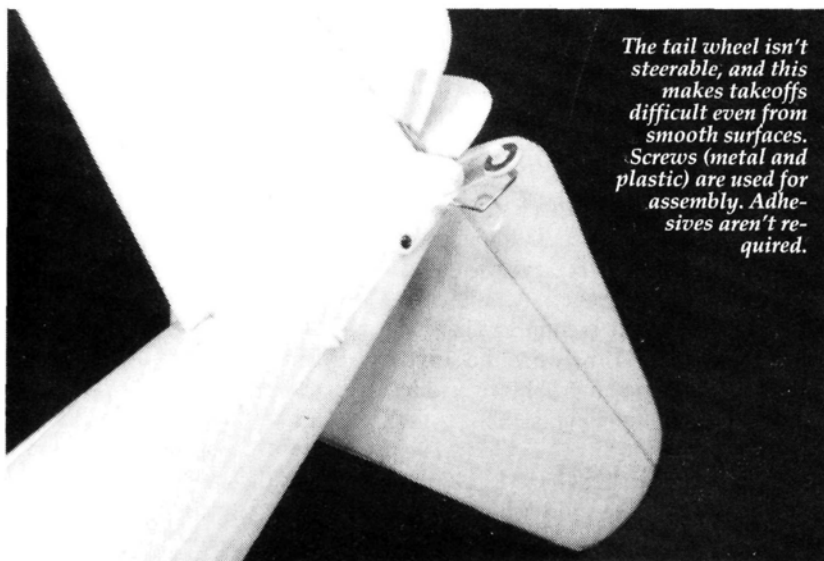
The molded-plastic tail group, which incorporates the two movable control surfaces (rudder and elevator), also comes finished. The hinges, which were a little too stiff for my liking, are formed in the molding process, and the miniservos that drive them worked well. The remaining parts are either of molded plastic, or metal—there isn't a piece of wood to

be found! When the time comes to assemble this “exotic” material, you'll use mechanical fasteners (call them screws) and double-sided tape to hold everything together. Cox supplies all of these with the kit.

GLITCHES?

The only trouble I had while assembling the little Fairchild was with the wheel-pant installation and the fit of the over-wing fairing. The illustrations that described the wheel-pant/strut assembly were confusing, but after disassembling the unit a few times, studying the drawing and reassembling it, all went well. Just remember to attach the gear strut to the *inside* of the wheel pant, rather than trying to bolt it to the outside. Given the rather complicated arrangement of the full-scale landing-gear/wing-strut scheme, Cox has done a fine job of duplicating the appearance of the original, while keeping the model's design simple and functional.

The tail wheel isn't steerable, and this makes takeoffs difficult even from smooth surfaces. Screws (metal and plastic) are used for assembly. Adhesives aren't required.



Trimming the over-wing fairing to the scribed line on the part will result in a fit that places it much too high and prevents it from matching the fuselage contour (see photo). Trimming it lower (eliminating the 90-degree molded flange) makes it fit better without sacrificing a lot of strength. Before permanently attaching it to the wing, trim it until you're satisfied with the fit.

PERKY POWERPLANT

As I mentioned earlier, Cox has produced more 1/2A engines than any other company in the world, and the one provided with the F-24 is one of its latest. Called the .049 Ranger (could it be because some full-scale F-24s were powered by in-line Ranger engines?), it's equipped with a spring starter, a substantial fuel tank and a variable-outlet muffler. It has been quite

RADIO INSTALLATION

It should come as no great surprise that Cox recommends a Cox radio for the F-24. Although molded to accept the Cox microserves, the equipment tray, which is also home for the receiver and battery pack, will accommodate other servos of the same size.

This review gave me the opportunity to try one of the new Cox Cobra radios. Available in both 2- and 3-channel versions, the Cobra is one of

nel that falls comfortably beneath the left index finger. Unlike the two-axis stick, this control has no trim function.

The rest of the radio package consists of a small receiver, a switch-harness/battery-box combination, two microserves and an accessory pack. Dry batteries are specified, with 12 AAs required—four for the receiver/servos and eight for the transmitter. It was interesting to note that Cox recognizes the potential difference in weight between alkaline and rechargeable AA cells. Because a Ni-Cd pack is lighter than alkaline cells, Cox advises that its use might require additional weight to get the CG at the correct location. This is good advice for new fliers, since it reinforces the need to check the CG.

Radio installation goes very quickly, since everything is pre-positioned. All that remains is to connect the pushrods between the servos and the control horns and install the wing.

WINGING IT

If you've followed the instructions carefully, you've

already assembled the wing panels that incorporate the required 2 3/4-inch dihedral. You'll attach the molded plastic strut brackets to the wing's lower surface with double-sided tape. To determine the proper location, I attached the wing to the fuselage with rubber bands, centered it and

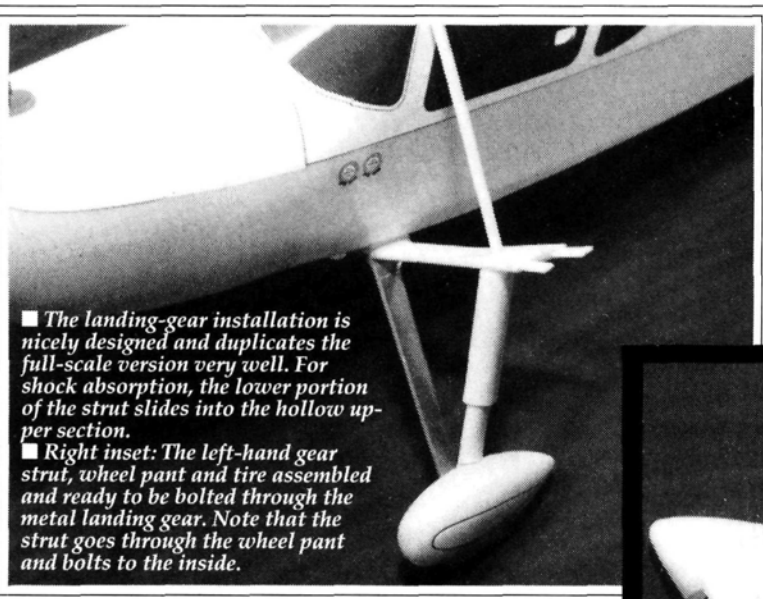
connected the wing struts to their proper receptacles on the landing-gear strut fittings. I then attached the strut brackets to the ends of the wing struts and positioned them on the

wing's lower surface.

With everything centered, I marked their location, applied the double-sided tape to the bracket and firmly pressed it into place on the wing. The strut brackets are "handed" (the left is different from the right), so be sure to use the correct set on the appropriate wing panel. Voilà!—you're just about ready to fly—but first, a message from the manufacturer!

TO THE TAPES, TO THE TAPES!

As part of the Fairchild 24 package, Cox has included a VHS tape entitled "Video Copilot." It runs for just over 12 minutes, reviews some of the assembly steps, shows pre-flight and post-flight inspections and walks you through that first flight from engine start to landing. The tape even gives the sounds of rich and lean engine runs. Although the tape says that the Fairchild 24 is for the intermediate flier, it takes the approach that the viewer is a beginner. (One



The Cox Cobra radio package and the supplied "Video Copilot" VHS tape round out the review items.

some time since I've run an .049, and I've rediscovered some techniques that had fallen by the wayside because of disuse. I'll mention them later when I get into the flying part of this review.

the nicest-fitting small radios around.

The case is contour-molded to fit your hands. The two-axis stick is positioned to the right of the case with (in the case of the 3-channel unit) a lever-type control for the third chan-

(Continued on page 101)

BUILDING

MODEL AIRPLANES

by JOE WAGNER

CATALOGUES, SOURCES & DREMEL ROUTER TIPS

I'M FREQUENTLY asked, "My local hobby shop doesn't carry this item; where can I order it?" In fact, most of the letters I receive are inquiries about where to obtain various supplies, e.g., modeling tools, materials and plans. There was a time when practically anything a modeler wanted could be obtained at the neighborhood hobby shop, but those times are long gone. No one store can stock it all, and we must often turn to mail order.

In the R/C field alone, there are airplanes, cars, helicopters and boats, and they all require unique product lines to support them. R/C airplanes range from 1/2As and mini-electrics to quarter-scalers. They're made from balsa, foam and/or molded plastic, and they can be finished with any of about 17 materials that range from tissue to epoxy-fiberglass.

Because I live in a small town without a hobby shop, I depend almost entirely on mail order for modeling supplies, and that's why I keep an extensive collection of mail-order catalogues. I couldn't get by



Left: A gold mine of useful information can be found in mail-order catalogues. From left to right: Sig, Ace and Tower Hobbies' annual catalogues.

without them! Whenever I receive a letter asking where to find, say, an 8-inch WW II-type bubble canopy, I thumb through these catalogues to locate a source (in this case, Sig*), and I send the information to the reader.

This correspondence takes time, however, and I think that most modelers should have their own catalogue-reference library. Such a resource saves considerable time in locating needed supplies, and it can be exceedingly educational—if you have the proper catalogues.

• Sig's catalogue, for example, not only lists the myriad items that they have for sale, but it also contains a comprehensive article on the background, uses and



Above: The companies that issue these catalogues are small, but the stuff they sell is mighty useful to model builders. Left: two of John Pond's four-volume plans catalogues.

structural strength of balsa wood. Other Sig articles discuss spruce, covering and finishing techniques, fillet-making and even glow fuels.

• Tower Hobbies'* annual catalogue is devoted primarily to merchandise, but it also contains a wealth of technical information. At the beginning of each section, there's a well-written overview of the subject. The material on engines is especially helpful, and it includes mounting dimensions, glow-plug sizes, crankshaft threads, fuel and

propeller recommendations.

• Ace R/C's* catalogue covers building your own electronic equipment (including R/C systems) from kits, plus complete Ni-Cd battery charging and maintenance information. Ace also lists a wide variety of model-building tools and hardware; more than any other supplier that I know.

• Penn Valley Hobby Center* puts out a newsprint "tabloid" catalogue that's loaded with off-the-

(Continued on page 86)

Monokote®

Now 5 Great Videos!

Learn from the pros at Top Flite! Step-by-step **MONOKOTE®** application details in clear, easy-to-follow, full-color close up action! Wings. Fuselage. Trims. Color-on-color. Designs. Hinging. Basic through advanced heat gun and iron usage techniques.

(Each tape approximately 1 hour).

"MONOKOTE® I"

Basics on Wings, Tail Sections, Fuselages, Hinging, Color Schemes and Trimming.

"MONOKOTE® II"

Advanced Color Schemes, Designs, Wing Tips, Multi-Color Combos, and MORE!

"MONOKOTE® III"

Airframe Prep, Advanced Wing Tips, More on Hinging, Color-on-Color, Graphics, Painting, and MORE!

"MONOKOTE® IV"

More on Wing Tips, Canopy Covering, Advanced Graphics, Striping, Car Bodies, and MORE!

"MONOKOTE® V"

Detailing Chrome, Scale Tips, Concave Surfaces, Fragile Wing Tips, and MORE!

**A COMPLETE
MULTI-TAPE COURSE
FROM THE MAKERS
OF MONOKOTE®**

GREAT FOR CLUB MEETINGS!

RENT OR BUY!

\$39.95 each

(\$20 Refund per tape on Rentals, if returned undamaged within 30 days.) Please specify I, II, III, IV, or V with order.

SPECIAL PURCHASE - ONLY COMBO OFFER

Combination 2-hour long tapes (Specify I & II or III & IV)

Only \$65 each! Save \$14.90!

(Sorry, no rentals available on Combo tapes)

Send check or M.O. with Name, Full Address and choice of VHS or BETA format to:



TOP FLITE MODELS, INC.

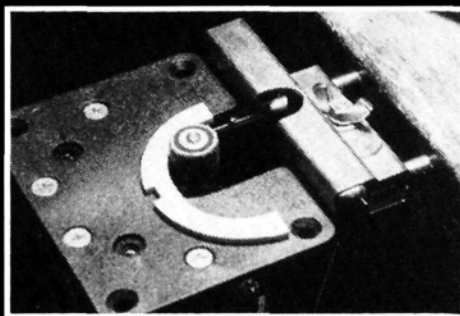
Monokote Video Course
2635 S. Wabash Ave.
Chicago, IL 60616

BUILDING MODEL AIRPLANES

(Continued from page 85)

ROUTING MADE EASY

Modelers who own Dremel Moto-Tools don't have to be told how handy these high-speed rotary-power tools are for grinding, routing and sanding. Now I've discovered a way to make this little machine even more useful with Dremel's Router Attachment.



Upside-down, Dremel's Router Attachment fits into two 1/4-inch holes in a workbench edge—an ideal tool for accurate profile-sanding.

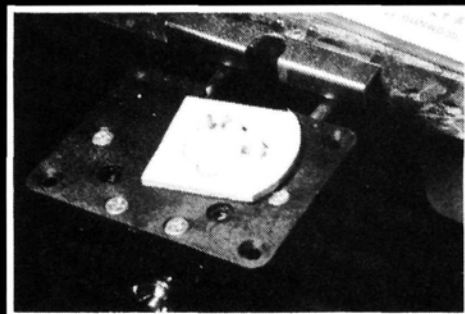
I've found that using the Router Attachment in the way Dremel designed it to be used isn't practical for many modeling purposes. The tool is so big compared to the size of most model parts that accurate positioning and control become almost impossible. Turn the machine upside-down, however, and it's an entirely new tool!

To accomplish this, I carefully drilled two holes horizontally into the edge of my workbench; they're 1/4 inch in diameter, exactly 1 7/8 inches apart and about 1 1/2 inches deep. The "rails" of the Router Attachment fit snugly into these holes, so that they can be inserted and removed in a few seconds.

The flat "table" part of the attachment provides perfect support for precision edge-sanding, and the movable "fence" makes an ideal guide for making grooves, corner radiuses, etc. Routing

interior cutouts in model parts, e.g., bulkheads, is also easily accomplished: begin in a drilled hole to avoid the need for a "plunge-cut" start.

I only wish I'd had this idea sooner—it has more than doubled the usefulness of my Moto-Tool!



Higley's 1/8-inch-diameter solid-carbide router bit in the inverted Dremel Router setup makes intricate cutouts in balsa and ply model parts easy.

beaten-track merchandise. For hard-to-find model kits, plans and materials, there are several small companies like this one whose catalogues I depend upon.

• "Old-timer Model Supply"* catalogue, by Ken Sykora, lists stuff from the good old days that's still mighty useful now, e.g., bamboo, colored tissue and in-

credibly light wheels turned from balsa. Ken also carries a considerable line of model plans.

• "Old Time Plan Service"* by John Pond is the source of model airplane builders' plans. It can supply you with full-size drawings for just about every model airplane ever kitted (current production kits and

(Continued on page 116)



Mike Kestner starting his 1/5-scale P-38 Lightning. Mike won "Pilot's Choice." (The model had counter-rotating props).



Dave Nicholson Jr.'s Focke Wulf-190. This Pilot kit flew extremely well, but it was rough on the ground in a crosswind.

First annual warbird rally—a big hit!

by WALLY ZOBER

THERE'S SOMETHING about military airplanes that excites both young and old—I guess it's knowing that these are fighting machines and that the pilots who flew them were bold, daring and courageous. I'm sure that every R/C club with more than 10 members has at least one or two ex-military pilots, and if you can get them to talk about their experiences, you'll learn a lot about military aircraft and have a very interesting meeting.

On May 5 and 6 1990, the R/C World Flyers held their 1st Annual Warbird Fly-In, and it was truly a gathering of eagles.

As is usual in Orlando, FL, the weather was perfect—two days of blue skies, a few scattered clouds, a light 10-degree crosswind at about 8 to 10mph and temperatures in the low 80s.

The Warbird Fly-In was for any R/C model of a fixed-wing warbird that flew from 1914 through 1979 (covering WW I, WW II, Korea and Vietnam). As CD, my purpose was to promote R/C, military, model airplanes, and the rules were very simple:

- there was no "builder-of-the-model" rule requirement;
- any military sport scale, fun scale, scale, or a factory-built ready-to-fly scale military model was eligible;
- any size of R/C model warbird—from a mini P-51 up to a giant-size

Spitfire—could be entered. (This Fly-In covered all military aircraft from prop-driven to jets.)
 • *ineligible* were "Sweet Sticks" with German markings and pattern or sport models painted to look like a military aircraft (the



Billy Sexton entered his nice-looking, nice-flying Top Flight P-47 Thunderbolt.



Jerry Flick's B-25 Bomber "C" model made from a Royal kit flew well on twin magnum 45 engines.

only "hard-nose" rule).

Plaques were awarded in the categories mentioned, and there was a special one for Pilots' Choice. On both days, in the hourly raffles, registered pilots could win anything from a bottle of CA to a Futaba 5 AUF-FM R/C system.

RADIO CONTROL

WARBIRDS

OVER ORLANDO

Clockwise from left: ■ Rex Strickland's huge A-26 Invader— $1/7$ -scale twin Zenoah G-38 engines; Futaba R/C system. It hasn't flown yet. ■ Bob Violet's F-86 Sabre won "Best Korean War model." ■ Page Holms' beautiful Fokker triplane from Ziroli plans.

BEST WW I MODEL

Bob Temple won in this category: his $1/3$ -scale Proctor Nieuport flew very realistically. Watching him fly this huge model airplane was like stepping back in time: with imagination, you could almost hear the artillery firing in the distance. I felt very nostalgic as I watched the Nieuport roll down the grass runway, lift off and climb. Bob did a series of graceful maneuvers—Chandelles, stall turns, Immelmans and loops. These WW I warbirds were usually slightly behind the power curve and, to do these maneuvers, the planes had to dive slightly to pick up enough speed to complete them. The Proctor Nieuport was no exception. Bob completed his routine with an excellent three-point landing, which spectators loved.

BEST WW II MODEL

Master model builder Phil Corso won best WW II model with his Byron "Zero"—truly a miniature aircraft. Equipped



Pat White's dynamite Messerschmitt ME-163 rocket plane. Mike did more flying with this model than anyone else at this fly-in.

with an O.S. 240 twin, the Zero has an onboard starter, Byron retracts, a fully detailed cockpit and a sliding canopy, and it's controlled by a Futaba 7-channel PCM 1024 R/C system. With its authentic-sounding engine, the Zero was very im-

pressive and flew at a scale-like speed. In this category, Phil actually tied with Mike Kestner, but there wasn't

enough time for a fly-off, so they agreed to a toss of the coin, and Phil won the toss and the trophy.

BEST KOREAN WAR MODEL

Bob Violet won this contest, superbly flying one of his products—a Master's F-86 Sabre Jet. The two-year-



Phil Corso's Byron Zero won "Best WW II Model."



Bob Fiorenze's F-4 Phantom won "Best Vietnam War model."



old F-86 has an impressive record: two firsts at the 1988 and 1989 Tangerine R/C scale meets; 1st place at the Scale Masters 1989; and 2nd place at the Top Gun Invitational. The Bob Violet Models F-86 is one of the most highly engineered models on the market, and its performance reflects this. One of the quietest models at the meet, its unique features include, drop tanks, cycling doors for retracts, operating flaps and working landing-gear struts.

BEST VIETNAM WAR MODEL

Bob Fiorenze brought his old campaigner—a Jet Model Products F-4 Phantom. This nine-year-old model has at least 80 to 100 flights on it and many victories: 1st at the 1983 and 1989 Nats, and five Masters Qualifiers. Controlled by a Futaba, 9-channel, 1024 PCM R/C system, this large, twin-engine

jet using two O.S. 77 engines and Dynamax fan units completed a nice demonstration flight and won first. Bob also demonstrated a Yellow Aircraft A-4 Skyhawk,



Phil Corso's second entry was a gorgeous Byron P-40 with an O.S. 300 4-stroke engine—great-flying airplane.

Cleveland

FIRST IN SCALE FLYING MODELS

WORLD'S WIDEST VARIETY OF AUTHENTIC FLYING MODEL PLANS. ★ ONLY A SMALL ASSORTMENT LISTED BELOW. REGULAR "IN-STOCK" PLANS. GET OUR FAMOUS SAME-DAY SERVICE

WORLD'S MOST AUTHENTIC MODEL PLANS—ALL PATTERNS INCLUDED		SCALE OF PLANS —				
ABBREVIATED NAME		1/24	1/16	1/8	1/4	1/2
37	Delia Comet Race	22*520	32*532	66*544	132*568	
40	Vought Cors F4U	20*520	30*526	60*545		
15	Cur JN4D "Jenny"	21*518	32*524	65*538	88*552	
16	Standard J-1 Tr	22*522	32*530	65*545		
29	Waco Taper-Wing	15*514	22*520	45*534	60*548	90*562
36	Westland Lynander	25*518	37*524	75*538	100*552	
35	Doug O-46-A Obsc	23*524	34*532	68*546		
29	Boeing 100 Sport	15*516	22*524	45*536	60*548	90*562
33	Stin A Trimotor	30*530	45*538	90*562	120*575	
39	Lock LighterF38	27*519	39*526	78*545		
39	Cur P-36A Fighter	18*515	28*520	56*534	75*548	112*556
25	Vgt Cors O2U-1/4	18*520	27*528	54*544	72*556	108*568
38	Con Catina PB53A	52*548	78*560	104*574		
19	Curtiss NC-4	62*566	94*589			
17	Fokker D-7 Ftr	14*512	21*516	42*530	56*540	84*549
31	Bayless Geo-Bee	11*512	17*516	35*532	47*544	70*556
13	Supermarine S.6B	15*510	22*513	44*526	60*538	89*552
36	Grum "Gulfhawk"	14*514	21*518	43*538		
35	Lock Electra #11	27*525	41*532	55*538		
43	Grum Avenger TBF	30*528	40*538	80*552		
42	Boe B17G FlyFort	51*540	77*552			
38	Na Mitchell B-25	36*537	55*551			
34	Macci-Castol MC72	15*515	23*522	46*535		
37	Cur Navy S03C-1	19*518	28*524	57*536		
25	C.Kacer K3C-1 62	11*515	16*520	33*530		
34	Doug Transp DC-3	47*540	71*550			
37	Cur Hawk P-6E	15*515	23*522	47*544	63*556	94*568
32	Doolittle GB#11	12*517	18*522	37*535	49*546	74*558
31	Boe F4B-34 P12B	15*516	22*520	44*532	59*544	89*558
32	Sprrld Bull-Dog	13*516	20*520	40*532	53*544	80*558
32	Howard IkeMike	10*512	15*515	31*526	42*538	62*545
34	Turners W. Kacer	13*512	19*516	39*528	52*540	78*552
35	How Mr. Mulligan	16*513	23*520	47*538	64*544	94*556
33	Boe P26A Low Wng	14*515	21*520	42*532	63*545	84*558
35	Stinson T-W SR-7	20*516	31*525	62*545	82*559	123*566
42	DI Mosquito Bomb	37*524	41*535	81*559	98*565	
37	Steelman PT-17	16*518	24*522	49*538		
43	N Bk Widow P-61	33*540	49*549	99*575		
30	TAMS Hawks Tex.13	14*513	21*518	43*536		
42	C.HeldivvSB2C4	25*525	37*535	74*566		
26	Ford Trimotor 4AT	38*538	57*548	114*572		
31	Bellanca Air Bus	32*522	48*530	96*552		
33	Grum J2F Duck	19*528	29*540	58*555		
28	C. Seahawk F7C-1	15*518	23*524	47*538	63*550	94*565
28	Sik. Amphib S-38	36*534	54*544	108*568		
16	H-Pge O-400 Bomb	50*545	75*556			
31	Lindy's L.Sirius	21*516	31*522	63*536		
31	Howard Rac-Pete	10*512	15*515	30*530	40*542	
31	C Sparhawk F9C-2	12*515	19*522	38*535	50*548	76*558
33	Aeronca C-3 Spt	18*510	27*514	53*526		
38	Turners Pesco Sp	12*516	18*520	37*536	49*548	74*556
03	Wright "Flier"	20*518	30*524	60*538		

READ BEFORE ORDERING
Minimum Order \$15.00
BE SURE TO ADD THE USUAL 10% FOR PACKAGING, POSTAGE, AND INSURANCE—ABOUT A THOUSAND ADDITIONAL PLANS • MANY SIZES • 6" to 128" • \$1 - \$89.
CATALOG \$2.00 OR PRICE LIST ALONE \$1 • NONE FREE • BY AIR, FOREIGN (EXC. CAN. & MEX.) \$3.
Phone Daily (216) 961-2600

NOTHING ELSE LIKE THEM!

Cleveland Model and Supply, Co.
Edward F. Rockwell, Administrator, Best Friend—Since 1919
9800A DETROIT AVENUE CLEVELAND, OHIO 44102

ORLANDO WARBIRDS

which flew well and is good starter kit for those who want to get into ducted-fan models.

PILOTS' CHOICE AWARD

The winner here was a real showstopper: Mike Kestner's P-38—a giant (1/5-scale) model powered by two Sachs Dolmer 4.2 engines with counter-rotating, three-blade props. When the two engines "sink out," they sound awesome. Mike uses a 9-channel Futaba, 1024 PCM R/C system with 21 servos, a 5,000mA flight pack, a 5,000mA ignition pack for both engines, and a 12V battery for the retractable landing-gear system.

The crowd loved Mike and Phil Corso's dynamite dog-fight demonstration with the P-38 and Byron Zero. Our announcer, Ed Izzo, added dog-fight sound effects by imitating the sound of machine guns firing over the loudspeaker system.

OTHER WONDERFUL WARBIRDS

Pat White had the neatest, all-wood, Messerschmitt ME-163 Comet, which he built from Dennis Brian plans. The full-scale airplane was rocket-powered, but Pat chose a Super Tigre 61 Blue Head engine and flew more than any other pilot at this meet. Like its full-scale counterpart, the Comet used a two-wheel dolly for takeoff. After rotating and reaching an altitude of 10 feet, it would drop the two-wheel dolly and come to life. Pat really burned some big holes in the sky with it, and it could make a great kit.

Dave Nicholson Jr. flew a very hot, aerobatic FW-190 (a Pilot kit) powered by a Super Tigre 40 engine with a Pitts-type muffler. In the air, the model was very stable and flew with authority; on the ground, like most tail-draggers, in a crosswind, it was a little "squirrelly."

Paul Hopkins' sharp-looking, Jet Model Products, F-4 Phantom done up in a camouflage scheme had some serious trim problems when airborne. At his side, Paul had Bob Fiorenze, who helped him trim the big jet. There were some anxious moments on takeoff, and one of the engines

wasn't quite up to full power, so Paul made one go-around and decided to land. (Discretion is the better part of valor.)

There's a lesson to be learned: if you want to compete at contests or look good at fly-ins, *do your homework at your home field*. At the Deland Golden Hawks R/C Club meeting, Bob Violett gave a talk in which he pointed out that one of the reasons his models perform so well at these meets is that they're flight-tested *before* and not *at* the events. There's no magic to winning—just hard work and doing things right!

Jerry Flick had his beautiful, silver, B-25 "C" model bomber (a Royal Kit), which he powered with two Magnum 45 R/C engines. The engines performed flawlessly and the B-25 flew well. Jerry finished the model with auto lacquer and, after a lot of "compounding" and buffing, it sure looked good.

Billy Sexton entered his Top Flite P-47 Thunderbolt. He had done a nice job of covering his P-47 in aluminum MonoKote and used a unique exhaust system. He attached high-temperature tubing to his muffler, ran it through the firewall and the fuselage and then out through the fuselage's bottom and rear. Now all the oil and dirt goes out through the plane's rear and bottom, so it's fairly clean after a day's flying—great idea!

Rex Strickland had a very impressive A-26 Invader bomber. This 45-pound, 10-foot-wingspan model drew the attention of both pilots and spectators. Truly a labor of love, it's powered by two Zenoah G-38 engines and covered with .010-inch-thick aluminum roof flashing. He hasn't flown it yet, but Rick assured me it was almost ready for that first flight.

Page Holms had an absolutely beautiful Fokker DR-1 triplane built from Nick Ziroli plans. Powered by a Quadra 45 engine, the triplane hasn't flown yet, because Page has a little more work to do on it.

Bob DeGrosa had one of my favorite models—an L-19 military

(Continued on page 116)

\$24.95 RC VIDEO \$24.95

REVIEW

presents

SOUTH WEST FAN FLY 1990

See the largest
Fan Fly in the World on
video. Exciting flying
footage of the most
up-to-date and unusual
jets including Ralph Braun's
Large Citation, Dennis Crooks'
F14 Tomcat, and Bob Violett's
new F16!!! Approximately
1 hour 45 minutes.



AVAILABLE ONLY FROM:
RC VIDEO REVIEW MAGAZINE
13360 KINGSBURY DR.,
WEST PALM BEACH, FL. 33414
(407) 790-3435

PLUS \$2.50 SHIPPING AND HANDLING,
CANADIAN ADD \$6.00
FLORIDA ORDERS ADD 6% SALES TAX:
VISA AND MASTERCARD

HELICOPTER SECTION

C O N T E N T S

92 Pad & Bench Review: HoroBo Condor 60
by Datu Ramel

98 Understanding Chordwise Center of Gravity
by Paul Tradelius

96 Rotary Wing Roundup

Helicopter Challenge by Craig Hath



In this issue's Helicopter Section, you'll find Datu Ramel's "Pad & Bench Review" of the HoroBo Condor 60—a large, highly stable machine that should be of interest to .60-size fliers and those looking to move up from their .30-size machines. In "Helicopter Challenge," Craig Hath continues his discussion of constant rotor speed with suggestions for achieving optimal performance. Finally, Paul Tradelius helps us understand the Chordwise Center of Gravity in our rotor blades—a technical area that's seldom addressed.

by DATU RAMEL

HIROBO'S NEW U.S. DISTRIBUTOR is Altech Marketing*, which will make a wider range of Hirobo helicopters available in this country. I have flown an MH-10 and a Shuttle ZX a lot this year, and now I can tell you about Hirobo's next-to-the-top-of-the-line Condor.

THE KIT

The Condor comes in a silver and blue box that's large enough to accommodate the long canopy and several smaller boxes of parts and sub-assemblies. No Styrofoam tray is used, because the boxes fit together like a puzzle.

CONDOR CONSTRUCTION

As you can see from the photos, the Condor goes together like many familiar metal-sideframe designs. Hirobo has done its manufacturing and engineering homework: the components fit together logically; the bolt holes line up precisely; and the instruction diagrams are easy to follow. Each sideframe consists of three pieces that are bolted together, and this makes changing an engine or doing repairs after a crash easier.

When I test-fitted the engine-mounting block to the sideframes, the start-shaft bearing blocks lined up perfectly. To secure the main-shaft bearing blocks and the tail-boom mounting block, I used M3 bolts instead of the specified self-tapping screws—only because I always ruin the slots in Phillips-head fasteners!

The rod lengths for the rotor head aren't explicitly stated, so setting them up took some experimentation. The key is to make sure that the long ends of the mixer arms are horizontal when the blade grips are at high pitch (10 degrees).

The collective-pitch mechanism has ball bearings everywhere and functions smoothly without backlash. The tapered landing-gear struts are injection-molded, and they're attached to the sideframes with eight bolts instead of the usual four. The carrier for the aileron, elevator

and tail-rotor servos is aluminum, and this eliminates the need for jigsawing, gluing, or painting. The pitch and throttle servos fit into openings in the sideframes.

The canopy that comes in the kit has a long rear fairing



PHOTOS BY DATU RAMEL & RAY LEON

This big bird offers a broad performance envelope for pilots who hot-dog, hover, or compete

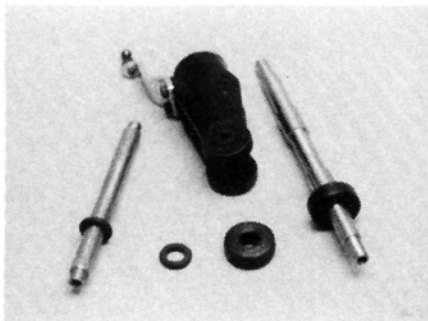
that extends behind the main shaft. (According to the instructions, another canopy is available; it looks like a larger Shuttle canopy, and it doesn't cover the rear of the mechanics.) There's no room under the fairing to mount the gyro on its



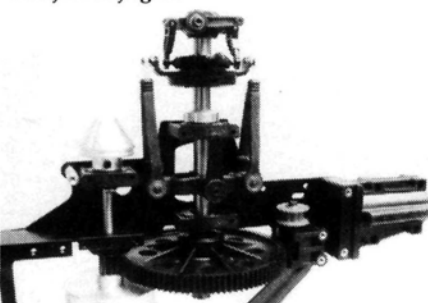
designated platform, so I moved the gyro in front of the start shaft, where it fits under the canopy.

My new mounting bracket blocked the path of the tail-rotor pushrod, so I mounted the tail-rotor servo aft, Schluter Magic-style, under the tail boom, instead of up front in the servo tray. For increased durability, I replaced the aluminum tail-boom supports with graphite kite rods. I also replaced the stock fuel tank with an 18-ounce Tetra* bladder tank to increase flying time and eliminate fuel foaming.

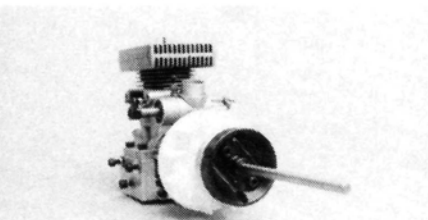
H I R O B O CONDOR 60



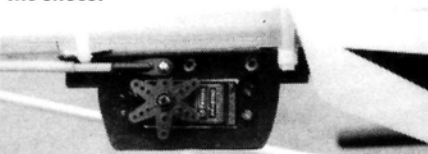
Clockwise from the top: Condor composite main-blade grip, feathering axle and damper; Champion O-Ring damper and feathering axle. The Condor damper is of a much harder material than the Champion damper; size contributes to response and feel in flight.



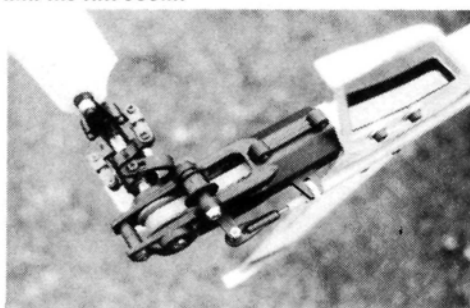
Close-up of composite washout unit, elevator levers, bearing blocks and main gear.



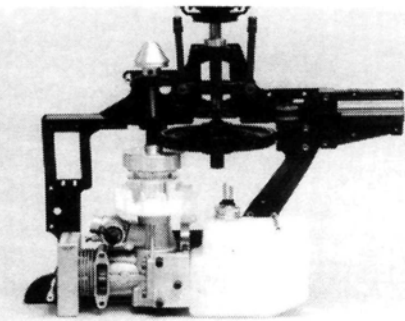
Hirobo's new clutches are dished, and this puts more clutch mass near the surface of the shoes.



Rear mounting of the tail-rotor servo uses silicone pads between the bracket and the tail boom.



Above: ■ The molded tail-rotor drive case is bolted around the rear of the tail boom. Idler pulley, external pitch slider and single-bearing 7-R blade grips can be seen in this photo. ■ The Condor's rotor head features a molded yoke that's "palm-friendly." The blade grips have a familiar Hirobo/GMP shape, and the flybar has symmetrical control arms. GMP Elite head is shown for comparison. ■ The Hatori 666 muffler comes with steel mounting straps; L-shaped brackets were made of 1/8-inch aluminum stock.



The partial assembly shows the layout of start shaft, elevator linkage, main gear, power take-off for belt drive, stock fuel tank and machined sideframe spacers.

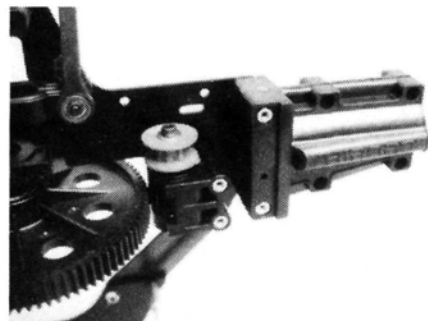
HELI POWER

I installed an O.S.* 61 Long-stroke heli engine with a Hatori* 666 muffler. The kit comes with collets that enable several makes of engine to accept the Condor fan wheel. Slotted holes in the sideframes facilitate fore-aft engine placement and gear-mesh setting. Because the Hatori muffler is attached to the manifold adapter with a silicone coupler, it requires additional support. I made short aluminum brackets and secured it to the portside landing-gear bolts.

FINISHING

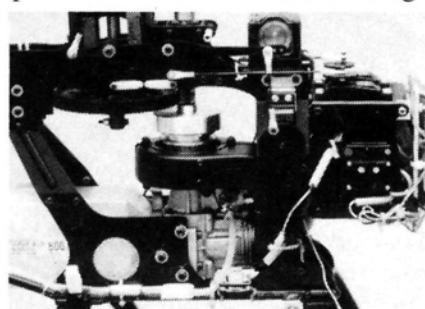
Each main blade is slotted to accept two lead weights. After you've fixed the weights in position using a small amount of 30-minute epoxy, the blades are ready for balancing and covering. With wooden blades, I achieve approximate balance by drilling holes in the tip of the heavier blade. After heat-shrinking the white blade covering that comes with the kit, do the final CG matching and balancing with trim tape.

The canopy halves are made of white polystyrene, and you can use CA to glue them together. I used 2-56 nylon bolts along the seam for some "breakaway"



Counter gear/timing pulley and molded tail-boom support. These components receive the sideframe bolts with threaded metal inserts.

potential in case of a crash. I also bolted the smoke-colored windshield into place. (Small self-tapping screws or CA would also work here.) To strengthen the canopy, you can put the windshield on without cutting

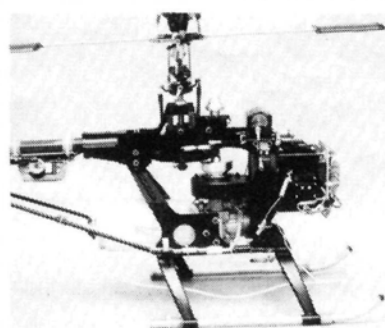


Condor mechanics in early summer configuration. Red tape at top of sideframe is calibrated to show collective-pitch settings. Bladder fuel tank fits snugly between the sideframes. D-I-Y arrow-shaft struts for the tail boom. The receiver is safely enclosed in the aluminum servo carrier, and the gyro is mounted forward.

an opening in it, but you won't be able to see your radio gear.

A nice set of blue and black decals comes with the kit, and I used them with some highly visible red trim tape to dress up the canopy. The canopy is attached to the mechanics





Condor mechanics. Tail-rotor servo is mounted on the boom. Arrow-shaft tail-boom support struts. High location of compact servo carriage allows access to the front-facing glow plug.

with four bolts, and to prevent the plastic from cracking under flight loads, I reinforced the polystyrene mounting holes with small plywood discs.

RADIO

The control system is a Futaba* 1024 9VHP with an S131 servo on collective and S9201 or S130 servos on the other four channels. After "eyeballing" and measuring, I set the servo-arm radius at the collective servo at an unconventional 17mm to use the full mechanical-pitch range. I wrapped the 1024 receiver and the gyro amplifier in foam and placed them inside the servo carrier on the lower aluminum plate. Holes for mounting the receiver and gyro switches have been pre-drilled into the servo-carrier uprigths.

HOW DOES IT FLY?

I bought a Condor so that I'd finally have a belt-driven tail in a .60-size machine. I learned to fly model helicopters with a Shuttle,

(Continued on page 116)



Condor rotor head is mounted on the main shaft using a machined-aluminum hub.

★ BEARINGS

BEARINGS

ONE OF THE LARGEST STOCKS OF
MINIATURE BEARINGS
FOR ALL RC CARS & HELICOPTERS



WE ARE
BEARING
SPECIALISTS.

CALL OR WRITE FOR
BEST PRICES, OR SEND
\$3.00 FOR BEARING
GUIDE FOR MODELS.
PHONE: (407) 488-9606
FAX: (407) 488-9609



— NORTH AMERICAN TOLL FREE —

1-800-332-3256 (U.S.) • 1-800-553-3256 (CANADA)
TELEX #467984 •

FOR RADIO
CONTROL CARS
& HELICOPTERS



BOCA BEARING CO.

7040 W. PALMETTO PARK RD.
SUITE 2304 A.
BOCA RATON, FL 33433

HELICOPTER ENTHUSIASTS

WE DO IT ALL

**BUILD YOUR HELI
TEST YOUR HELI
REPAIR YOUR HELI**

COMPLETE CONSTRUCTION WITH
NEW OR YOUR RADIO
SET UP AND PAINTED

AND
NOW

CUSTOM BUILT & BALANCED
OTOSPORT MAIN BLADES

\$45⁰⁰

BUILT AND PAINTED CANOPIES
YOUR CHOICE OF ANY 3 COLORS

\$79⁰⁰

CALL FOR OUR LOWEST
PRICES ON HELI KITS

WRITE OR CALL FOR INFORMATION

BOLAR HELI RESEARCH

215
377-4941

322 NORTH 7TH ST.
LEHIGHTON, PA 18235

215
377-4941

THE MOST COMPLETE CATALOG OF HELI AND CAR KITS, PARTS & ACCESSORIES!!

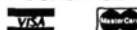
DR.J's West Coast
Hobby
Warehouse



- Schluter
- Miniature Aircraft
- GMP
- Hirobo
- Kyosho
- Dr.J's
- JR Radios
- OS
- Enya
- Webra
- Kalt
- Associated
- Tamiya
- Bolink
- TRC
- JR Propo
- PDI
- Losi
- Traxxas
- Hirobo
- Novak
-and more!



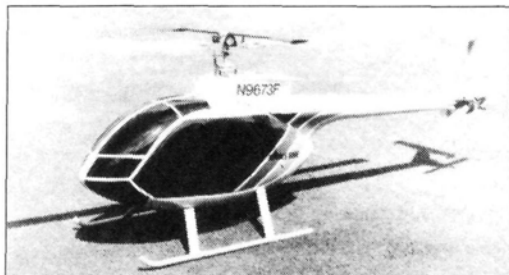
ONLY \$2
REFUNDABLE
WITH FIRST
PURCHASE



CALL US TOLL FREE AND ORDER YOUR CATALOG TODAY!
45640 23RD ST. W., LANCASTER, CA 93536 **800 622-2092**

**FOR ADVERTISING INFORMATION ON THE
MOST WIDELY READ HELICOPTER
SECTION IN THE R/C INDUSTRY,
CALL JASON OR JULIA (203) 834-2900**

ROTARY-WING ROUNDUP

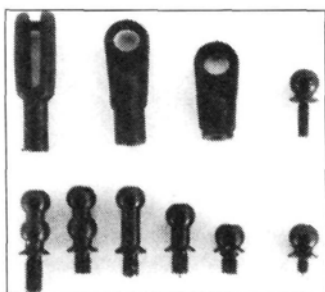


HOBBY LOBBY FUSELAGE CONVERSION KIT

Hobby Lobby is now selling a scale Hughes 500E fuselage conversion kit to be used with its Sport 500 mechanics. All the parts are made of fiberglass, including the tail boom, which is designed to be structural.

Price: \$113

For more information, contact Hobby Lobby International, Inc., 5614 Franklin Pike Circle, Brentwood, TN 37027.



MINIATURE AIRCRAFT HARDWARE

The parts are perfect for those times when you're grounded by the failure of a small, inexpensive linkage part. This line of hardware includes threaded steel balls in a variety of configurations and strong clevises with metric threads.

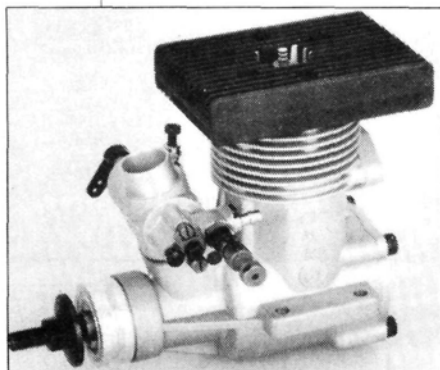
For more information, contact 2324 N. Orange Blossom Trail, Orlando, FL 32804.



ALTECH MARKETING

Hirobo announces the addition of the Shuttle Z and Shuttle ZX to its line of flying machines! The shuttle Z is a "stretched" version of the original Shuttle: its main blades are weighted and longer; the tail boom has been lengthened; and a new tail-rotor system has been added. The Shuttle ZX has a metal clutch, full ball bearings and tail-boom reinforcement struts. Both the Z and the ZX feature the new FZ rotor head. To top all of this, the Enya SS35 Heli TN engine is included in certain assembled versions. Altech Marketing, in conjunction with Hirobo, is making kits, parts and service for Hirobo helicopters available in the U.S.

For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818.



O.S. ENGINES .61 RFN-H & .61 RFN-H ABC

Ideal for U.S.-style flying, the O.S. .61 RFN-H weighs 20.5 ounces and has an rpm range of 2,000 to 16,000 and 1.7bhp at 16,000. This allows tight loops and loops without hesitation. The .61 RFN-H is available in ringed or ABC versions.

Part no. OSMG 1988; OSMG 1989.

Price: \$289.95; \$299.95.

For more information, contact Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 618220.

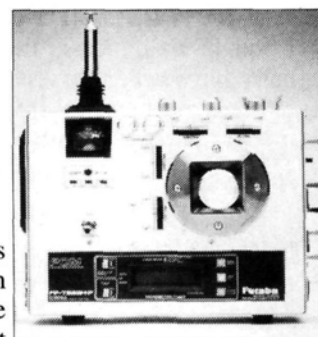
FUTABA CORP. 8-CHANNEL PCM SINGLE-STICK

This system is delivered with an R128DP receiver, five S9201 servos, invert switch, dual-rate/VTR, mixing, ATL, ATV, DSC, servo reverse, tacho-timer, plug-in RF module and 1,000mAh receiver Ni-Cd. Available in frequencies: 50 and 72MHz.

Part no. 8SSH9201DN72

Price: \$1,179.95

For information, contact Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.



UNDERSTANDING CHORDWISE CENTER OF GRAVITY

by PAUL TRADELIUS



A good set of balanced rotor blades with the proper chordwise CG can make even an inverted helicopter a pleasure to fly.

I THINK it's safe to say that most helicopter fliers today buy a commercially available set of main-rotor blades, finish them as needed and then simply bolt them onto their favorite machine. The term "commercially available" could refer to anything from a rotor blade that must be glued and finished to a ready-to-fly set of fiberglass blades. Certainly, one of the advantages of fiberglass blades is that the manufacturer has built them to exacting standards. They're correct in spanwise and chordwise CG, and they require no further work for optimum performance.

I think that most modelers, at least here in the U.S., buy the less expensive wooden rotor blades, which require some work before they're ready to fly. When they're finished correctly, they perform as well as the most expensive set of ready-to-fly blades. The key is to finish them correctly, and this includes sealing and painting the wood where required, covering them with your favorite material, and checking the spanwise CG and overall blade balance. Many fliers fail to check the chordwise CG. If this is incorrect, the helicopter could

feel unstable and "mushy" on the controls, and it could overwork your servos.

To make sure you understand chordwise CG, I'll first define some of the terms needed in this discussion. Then I'll take a look at several chordwise CG positions and analyze their effects on the control system.

Airfoil aerodynamics can become complicated in a hurry, so I'll stick to the basics and follow the KISS (Keep It Simple Stupid) principle. Many who are new to the hobby may not be familiar with the terms we use, so I've listed some of them, just to make sure we're all talking the same language.

Airfoil—the side view, or shape of the rotor blade as viewed from the end of the blade.

Angle of Attack—the angle, usually expressed in degrees, between the relative wind and the rotor-blade chord.

CG (center of gravity)—the balance point of all the weight. (There's as much weight in front as there is behind this point.)

Chord—the straight-line distance from the very front

Properly adjusted chordwise CG yields better performance and reduces servo loads

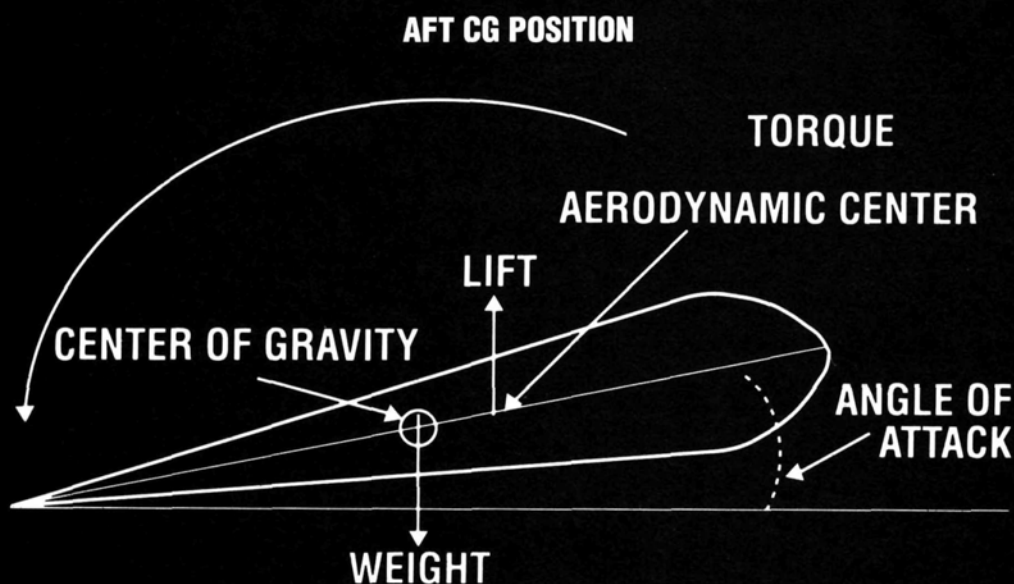


Figure 1 shows an undesirable aft CG position at about the 40-percent chord. But why is it undesirable? Let's take a closer look.

Notice that the CG is behind the AC, and that this will also produce a torque, or twisting force that will further increase the angle of attack. If this angle of attack is allowed to increase further, the lift will also be increased, and this will result in even greater torque to increase the angle of at-

tack even more. An aft chordwise CG is a very unstable aerodynamic situation that can affect your helicopter's performance and put a strain on your servos as they counter this increasing torque load.

You can improve this situation by moving the CG forward of the aerodynamic center of your rotor blade, as shown in Figure 2.

to the very rear of the blade. Depending on how big the chord is, this distance may be measured in any convenient scale, e.g., millimeters, centimeters, inches.

Chordwise CG—the point along the chord where there's as much weight in front as there is behind that point.

Aerodynamic Center (AC)—the point at which the lift force acts on the airfoil. Although the entire airfoil produces lift, think of this as the center of lift, just as you thought about the CG as the balance point for weight. Also, for all practical purposes, this lift is produced roughly at the 25-percent chord, or one-quarter of the way back from the leading edge on almost all airfoils that we use.

I've experimented with a flybar head and flybarless head on a Horizon helicopter, and I've found that the chordwise CG of the rotor blades must be corrected accordingly. Standard rotor blades are made of hardwood for the first third of the chord, and the rest is made of balsa wood, which keeps the chordwise CG forward. More weight is also added to move the chordwise CG

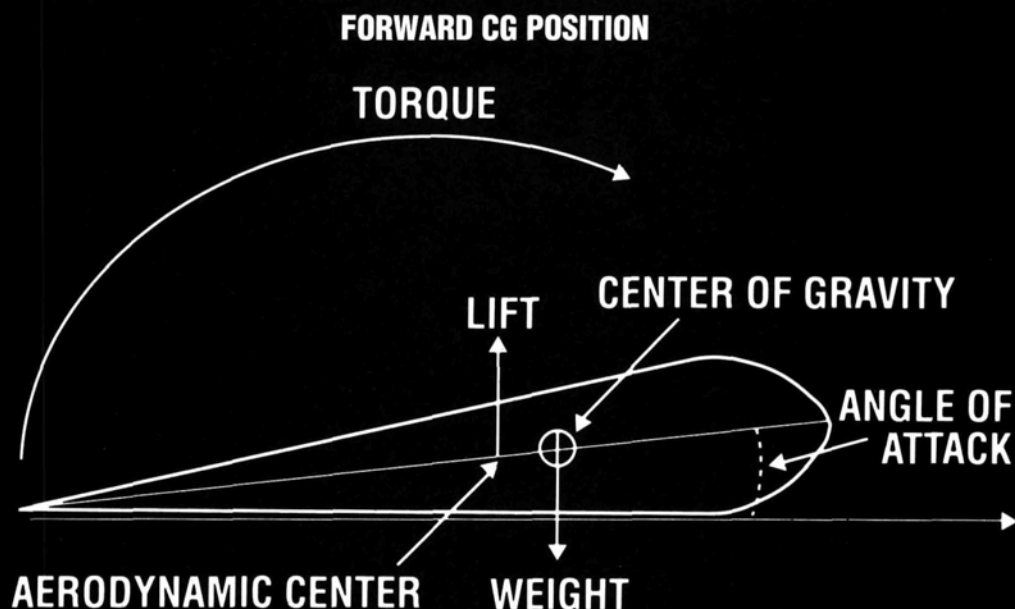
forward to approximately the 25-percent chord.

When you fly without the flybar, you'll need a different set of rotor blades—a set that has more weight added to move the chordwise CG even further forward. I've tried different combinations of the two sets of rotor blades (with and without the flybar), and the flying characteristics of the helicopter were drastically changed. Once, I tried flying the heavily weighted blades with the flybar head. The forward chordwise CG made the helicopter very stable for hovering and forward flight, but when I tried to do a loop, the blades were so "stable" that I almost didn't pull out. I'm glad I had a lot of altitude at the start—I needed it.

LOCATING THE CHORDWISE CG

With all this discussion of chordwise CG and the effects it has on the helicopter's performance, I imagine a lot of you are saying: "The theoretical stuff is fine, but how do I know where my chordwise CG is,

(Continued on page 100)



Notice how torque is produced by the action of the AC and the CG, but the torque in this example is going in the opposite direction to that in Figure 1. This tends to reduce the angle of attack and, therefore, it stabilizes the rotor blade and control system. This stabilizing effect will be seen throughout the helicopter's flight envelope, and it will create a smoother, more positive control response.

Chordwise CG also affects radio equipment—most noticeably the servos. Imagine the example in Figure 1 with the aft CG and the unstable torque that it produced. What do you think counters this unstable torque to prevent the rotor blade from “running away”? It has to be the power of your servos, and this means you're needlessly loading, or working, them. Not only does this put a great strain on your servos, but it also drains your battery

pack. This could substantially reduce your flying time per charge, and it may also explain the causes of some crashes. Could the battery have been drained by the excessive power requirements of the cyclic and collective servos?

Also notice that a large servo power requirement could exist if the CG is moved too far forward. In this case, the rotor blade would really be stable, and the servo must again use excessive power to position it. I remember trying to fly a large, gas-engine-powered helicopter with a flybarless head, but because of the helicopter's weight and extremely forward chordwise CG, the servos weren't strong enough for adequate control. Only when I used the then most powerful Airtronics* servos available (with torque in the 80 inch/ounce range) did I have sufficient control of the helicopter.

(Continued from page 99)

and how do I correct it, if necessary?”

You can find the chordwise CG with workshop accuracy by using a sharp straightedge (e.g., a ruler or flat-edge razor) as a balance beam. Mount the straightedge in a vise, then balance the rotor blade on it at an angle of 30 to 45 degrees. With a pencil, mark the underside of the rotor blade along the balance line. Then balance the blade again, only now, rotate the blade to about the same angle, but in the opposite direction. Mark as before when the blade is balanced. The point where these two lines cross is the chordwise CG. To find the chordwise CG expressed as a percentage of the chord, use the following formula:

$$\text{Chordwise CG} = \frac{\text{distance from leading edge to CG}}{\text{chord}} \times 100$$

Here's an example: the chord is 63mm. The rotor blade is balanced as already described, and the two balance lines cross at a point that's 17mm from the leading edge of the rotor blade. Therefore:

$$\text{Chordwise CG} = 17 \div 63 \times 100 = 27 \text{ percent}$$

In this example, the chordwise CG was in a very desirable location, but of course, you may not be as lucky with your actual measurements. If your chordwise CG has to be moved forward, you'll have to add weight near the leading edge of the rotor blade. (An explanation of this technique will require a separate article.)

If you find the chordwise CG is too far back—say, more than 30 percent—try using a set of weighted blades. We usually think of adding weight to rotor blades to improve their autorotation capabilities, but this extra weight is usually installed near the leading edge, and this also moves the chordwise CG forward. Try a set of weighted blades; they might give your helicopter a more solid feel.

*Here's the address of the company mentioned in this article: Airtronics, Inc., 11 Autry, Irvine, CA 92718. ■

FIBERGLASSING WINGS

(Continued from page 78)

That alone is the greatest reason for glassing an airplane!

PICK YOUR PROCEDURE

There are many articles on how to do this and how to do that. Please remember that no method is better than another if the results are the same. Pick a method that suits your building style, and run with it—perfect it. If you like the way a product works, stay with it. Results are all we're interested in.

My next special report will offer all the skinny you could ever hope for on how and where to use Violett Supplies' extensive line of carbon-fiber materials. Talk to you then!

Here are the addresses of the companies mentioned in this article:

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171.

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

Dan Parsons Products, 11809 Fulmer Dr., NE, Albuquerque, NM 87111.

Z-Poxy; distributed by Pacer Technology & Research, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708. ■

SPORTY SCALE

(Continued from page 65)

everything is mass-produced, and you don't have to take a number to get a set.) If you send Impact a SASE, they'll respond with a wealth of information about their struts, wheels, brakes and tires. (Pssst! Don't forget to tell them you got the scoop here!)

PLENTY OF PLANS

The building season just wouldn't be the same without a Bob Holman Plans* catalogue. Yeah, I know; I've mentioned him many times, but I can't help talking about him again. His new issue is called *Dream Book*, and I think the title fits his catalogue perfectly. To be brief, Bob Holman has a plan for just about any R/C airplane ever designed...period!

Whether you want a plane from the dawn of flight to the 1990s...he has it. For this building season, he's introducing a new Typhoon with a 70-inch span, Brian Taylor's new P-38, a 1/4-scale Fokker D-VIII, a beautiful 1/4-scale Pfalz, a 70-inch Stuka, a 74-inch Dornier DO 17z, a

96-inch deHavilland Rapide, a 71-inch French aerobatic TR-260 and a snappy-looking, 69-inch P-51 Mustang (also designed by England's Brian Taylor). If you don't have a copy of Bob's catalogue, you're really missing something. It only costs \$5 and a large SASE. Unless you're from another solar system, I guarantee that you'll read this dream book from cover to cover—several times!

PARTING THOUGHTS

Well, that's all for this month, scale fans. Not too much to report on the Top Gun Invitational except that it's coming along well. This year, there are team entries from Europe and expert entrants from England, France and Brazil.

There are still a couple of team-scale slots open if you have the experience to compete. Just drop me a line with the name of both team members and a daytime phone number. Watch for the Top Gun advertisements for more information as we proceed. Just remember, the dates are May 2 through 5, and the city is West Palm Beach, FL.

Until next time, remember these very important things about this wonderful sport of scale modeling:

- you *won't* get more air to the blades of your autogyro by installing a pusher prop.
- "aileron flutter" is *not* cute.
- squeezing the heck out of your new engine's silencer in a vice *won't* increase your muffler pressure.
- and, *please*, when you travel to countries that rely on camels as the primary form of transportation, check your six!

*Here are the addresses of the manufacturers mentioned in this article:

Proctor Enterprises, 25450 NE Eilers Rd., Aurora, OR 97002.

Monogram Models, Inc., 8601 Waukegan Rd., Morton Grove, IL 60053.

Zenith Aviation, P.O. Box 1/RC110, Osceola, WI 54020.

Historic Aviation, 1401 M. Kings Wood Rd., Eagan, MN 55122.

Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708.

Impact Engineering, 2100 Stonehill Ct., Arlington, TX 76012.

Bob Holman Plans, P.O. 741, San Bernadino, CA 92402. ■

FAIRCHILD 24

(Continued from page 84)

might question just how a beginner reached the intermediate level without already knowing these basics!) That fact aside, the tape does provide useful infor-

(Continued on page 108)

More Fun. Less Funds!



ESCAPE

SPECIFICATIONS:

Wing Span	62½ inches
Wing Area	770 square inches
Engine Size	10 cc 90 or 120 four stroke

Designed for AMA for the FAI Turn-around pattern. Foam wing and stab with 3-32 Balsa sheet covering. Tricycle or conventional gear, fixed or retracts. Rear or side exhaust, fiber glass canopy. Very positive and maneuverable.



XLT

SPECIFICATIONS:

Wing Span	65 inches
Length	65 inches
Wing Area	845 square inches
Recommended Engine Size	10 cc 90, or 120 four stroke

The XLT is designed for tuned pipe and retract landing gears. Capable of the A.M.A. or Turn-around pattern. Rear or side exhaust.



UTTER CHAOS

SPECIFICATIONS:

Wing Span	63¾ inches
Wing Area	700 square inches
Engine Size	.50-.60 (Glow) .90 four stroke

For fun, sport, pattern, or turn-around, all of these can be done with the Utter Chaos' completely built up Balsa construction. Canopy and engine mount included. Many years of proven flying reliability.

BRIDI AIRCRAFT DESIGNS, INC.

23625 Pineforest Lane
Harbor City, California 90710
(213) 549-8264 • (213) 326-5013

SEE YOUR FAVORITE
HOBBY SHOP OR
RETAIL OUTLET



Dealer Inquiries Invited

Helicopter Challenge

SETTING YOUR RADIO TO ACHIEVE CONSTANT ROTOR SPEED

by CRAIG HATH

WELCOME BACK TO the continuing saga of the battle to master the rotary-wing model! In the last issue, we studied the theory and benefits of the constant-rotor-speed (CRS) setup. In this issue, I'll review the basics and look at how to achieve CRS with some of the popular available radio systems.

THE BASICS

For a detailed look at CRS you should review last month's column. Overall, you're trying to achieve a

CASE STUDIES

Here are two examples of a model that isn't operating with the engine matched to its peak power level:

- When the helicopter is hovering, the rotor speed seems low. The pilot advances the throttle to full power, and the rotor speed remains somewhat slow or even reduces slightly. At first, the helicopter lurches skyward, then it lugs its way around the sky.
- When the model is hovering, the rotor speed seems slightly high. As the pilot advances the throttle to full



■ Above: Silas Kwok flies his beautifully detailed Jet Ranger at last year's National Championship. Silas uses a constant-rotor-speed setup to simulate a full-size heli. ■ Opposite page: The JR's new x-347 computer-based radio system makes setting up CRS really easy. The new wave of radios save you time when you're trying to get things the way you want them.

setup in which the model's rotor speed remains constant throughout almost any flight attitude. This makes the model easier to fly, because you manage the power delivered by the engine better and reduce the lag time that often occurs when you make collective-pitch and throttle changes.

To set up the helicopter for CRS, you must match the throttle's opening and closing to the angle of attack and speed of the rotor blades. You should also find the engine's optimum power band and adjust the throttle/collective so that the engine operates within it. The only way to measure a model's performance is by observation, so you have to use your senses to determine whether you've achieved optimum performance.

power, the rotor speed increases even more, but the helicopter only wanders skyward. As it completes the transition into full-forward flight, the rotor speed and the engine are screaming, but the helicopter doesn't seem to be going anywhere.

In the first example, the collective pitch is set too high at both hover and full throttle. The engine is operating below its best power curve, and the load placed on it by the rotor disc is too great for the engine to reach peak output. In the second example, the hover and full-power pitch settings are too low, and the engine has been allowed to over-speed beyond optimum power.

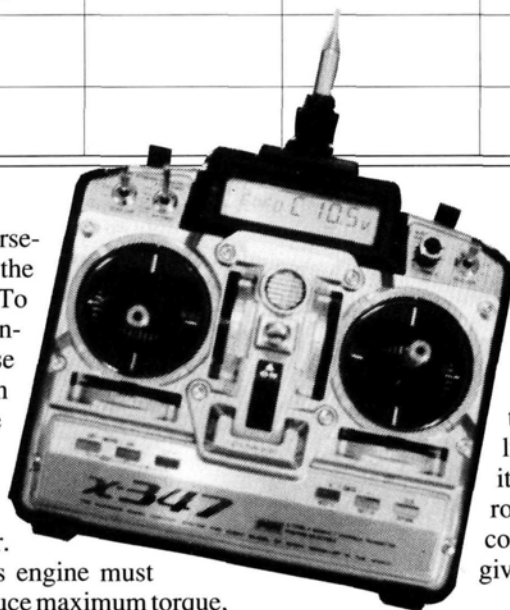
If you look at the output specifications for any internal-combustion engine, you'll find two sets of

CONSTANT-ROTOR-SPEED TROUBLESHOOTING CHART

(All the adjustments refer to changes for pitch or throttle curve at the throttle/collective-stick position where the condition occurs.)

CONDITION	ADJUSTMENTS				
	ADD MORE PITCH	ADD THROTTLE	REDUCE PITCH	REDUCE THROTTLE	CHECK FUEL MIXTURE
Hovering rotor speed too low; poor response to throttle.		X			
Hovering rotor speed too low; good response to throttle.			X		
Hovering rotor speed too high; poor response to throttle	X	X			X
Hovering rotor speed too high; good response to throttle.	X				
Rotor speed bogs down on full-power ascents but recovers once in forward flight.		X			X
Rotor speed bogs down on full-power ascents and continues to bog down in forward flight.		X	X		X
Hover speed and throttle response OK; rotor over-speeds at full power.	X				
Hover speed and throttle response OK; rotor bogs down at full power.			X		
Rotor over-speeds during descents.				X	
Rotor speed drops below hovering rotor rpm during descents.		X			
Helicopter floats down during descents.			X		
Helicopter races down during descents.	X				
Engine doesn't respond well after long descents.					X
Hovering rpm changes after heli has completed a full					X

figures: one set is the maximum horsepower at a certain rpm; the other is the maximum torque at a certain rpm. To get the best performance from an engine, you must operate it within these rpm ranges under a load. You can increase the load until it slows the engine below the optimum rpm range. Above this point, and up to the maximum rpm level, the engine is producing maximum power. The load placed on a helicopter's engine must permit it to turn fast enough to produce maximum torque, but not so fast that it races through the power curve.



With CRS, we're attempting to physically open and close the carburetor's throttle barrel as needed so that the engine will produce power that corresponds with the main rotor-blade pitch changes. With luck, the engine will operate in its maximum power range, the rotor speed will remain fairly constant, and the helicopter will give its best performance.

(Continued on page 105)

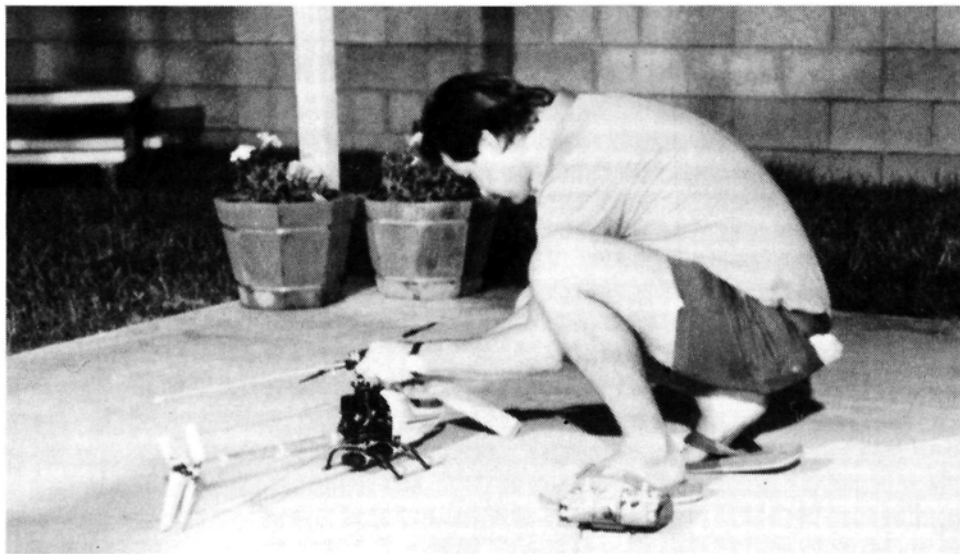
HELICOPTER CHALLENGE

(Continued from page 103)

TROUBLESHOOTING THE CONSTANT-ROTOR-SPEED SETUP

I wondered how to gather and share this information without stringing my article

For instance, on page 101 (paragraph 2) I stated, "You may also notice that you need to hold a slight amount of forward cyclic to keep the machine from stalling." Ray maintains that a helicop-



Craig Hath continues to work with the Kalt Whisper; follow-up details on this "fun" helicopter will be in a future issue!

out into a year's worth of columns! I examined six popular computer-based radios and found enough similarities to combine all the info into a chart. This chart might oversimplify the setup of a couple of the more complicated systems, but you can take it to the field and use it for troubleshooting while you're perfecting your setup.

To determine the problem, carefully evaluate your flying condition. Have patience; work on one condition at a time. Always be sure that the engine's fuel mixture is a little on the rich side, and periodically check it at full power during your adjustment sessions. Depending on your flying abilities, you might need help from an experienced flier, and I strongly recommend that you set-up your machine with CRS before you try to learn forward flight. I hope you'll find the chart useful.

FEARLESS FLIGHT?

My friend and fellow columnist Ray Hostetler called me recently in reference to the "Heli Challenge" in the November '90 issue. He was concerned that some of my terminology on keeping a helicopter in forward flight might scare off a few fliers—especially those who fly fixed-wing aircraft!

ter won't actually stall at this time. What I really meant is that you need to maintain enough speed to control the helicopter during its flight. On page 111 (paragraph 1), I said, "If allowed to continue, these errors will result in a reduction of rotor speed to a point below minimum flying lift, and the helicopter will stall." To be more precise, the rotor system won't be producing sufficient lift to maintain flight. To actually *stall* the rotor system, the rotor speed must drop below the point where it generates enough lift for its given angle of attack; the word "stall" is definitely misleading here. To the fixed-wing fliers who panic when they hear the word "stall," relax; it's pretty tough to stall a chopper! My thanks to Ray for clarifying those points.

UPCOMING...

Last month, I attended the Merced Fly-In in Merced, CA, and, as usual, I had a great time! In an upcoming issue, I'll cover the fly-in in a special article. Until next time, keep practicing! ■



Hobby Lobby's CATALOG 17 is FREE! in the USA.

Hobby Lobby's Catalog 17 has MORE items for the RC beginner; there are MORE flyable airplanes for the RC beginner and the best beginner's RC aircraft and boats available. It has dozens of NEW items that have never been seen before in the USA:

NEW electric powered aircraft, NEW motors, NEW and innovative hardware; NEW sailboat, NEW RC sailplanes — dozens of NEW items! Hobby Lobby's NEW Catalog 17 is bigger — 120 pages most of them in color!

**Catalog 17 is FREE
in the USA.**

**Just call (615) 373-1444
or send the order form.**

**Or, call for fast first class mail
\$2.00 — bill to your credit card.**

**Outside USA send \$5.00 for
Airmail delivery (or charge
to your credit card).**

MAN

Name

Street Address

City

State

Zip

HOBBIY LOBBY
INTERNATIONAL, INC.®

5614 Franklin Pike Circle
Brentwood, TN 37027
(615) 373-1444

MINIMAX-700

TWO METER SAILPLANE

EXPERT BUILDERS WILL ENJOY BUILDING AND FLYING THIS GLIDER. MANUAL HAS 32 PAGES AND 174 PICTURES FOR THE NOVICE. THE 700 IS DESIGNED LIGHT WT. AND SLOW SPEED FOR SOARING THE LIGHT THERMALS AS THE FAST HEAVY CRAFT ARE PUT AWAY. KIT COMES WITH 241 PIECES, 109 MACHINE CUT PARTS READY TO ASSY. WITHOUT ANY CUTTING OR SANDING. ALL ACCESSORIES INCLUDED, PLUS, CONCEALED ANT. TUBE. ROLLED PLANS LIGHT WEIGHT WING SIMILAR TO THE REAL THING, LEADING "D" EDGE, FULL LENGTH WEBBED SPAR, BOXED IN CENTER SECTION. WING DIHEDRAL IS BUILT IN, NO TEMPLATES.



\$46.00

We Accept



GOTTINGEN MOD. 385 AIRFOIL
WINGSPAN 78"
CHORD 10"
WING SQ. IN. 719.250
WING LOADING 3.82 OZ./SQ. FT
LENGTH 43"
WEIGHT, READY TO FLY 19 OZ.

ORDERING ONLY: 1-800-328-1288, MASTER CARD, VISA, OR C.O.D.

HOT-LINE: 1-509-683-1288 FOR INFORMATION.

SEND CHECK OR MONEY ORDER TO MINIMAX ENTERPRISE P.O. BOX 2374 CHELAN WA. 98816

MODEL SCHOOLS
AND DEALERS WELCOME

FAIRCHILD 24

(Continued from page 101)

mation and stresses the need for safety—something that should be instilled in every beginner right from the start.

SO, IT'S FLYING TIME AGAIN

As I headed out to the flying field, I began to rediscover 1/2As. I looked over my right shoulder while driving, and the little Fairchild seemed lost in the space at the back of the van that's usually occupied by one of my jets or my new 1/5-scale Fokker

D-VII. Missing was the usual complement of support equipment, e.g., fuel pumps, gallon gas cans, retract air pumps and electric starters. All I needed for this little squirt was a 1-quart container filled with Ritch's Brew* 25-percent fuel, a Hobbico* Ni-Cd starter adapted with a Cox glow clip, a spare plug and a squeeze bottle.

To give the F-24 the best shot at its first flight, I waited for the end of the day until the wind had subsided. Filling the tank was the first treat. If you're accustomed to burning 8 to 20 ounces of fuel for a 10-

minute flight, you'll delight in the endurance of the little .049 on the same amount of fuel—8 ounces could be an all-day supply!

After connecting the glow-plug clip and priming the engine directly into the exhaust port (make sure you rotate the muffler spring to expose the exhaust slits), I wound the spring starter one turn clockwise and released the prop. After a few tries, the Ranger caught, and I tweaked the needle valve so it was just "off peak." I ran this tank out as a break-in and rich-

(Continued on page 111)

MODEL AIRPLANE NEWS

QUARTZ WATCHES

FOR R/C SPORTS

from Robic

You won't want to be without one of these handsome R/C sports quartz watches. These beauties look great, and they offer many advanced features:

- Precise quartz analog movement
- Uni-directional, 60-minute elapsed-time ring
- Non-corrosive, high-impact ABS-resin case
- Water-resistant to 30 meters
- Sweep second hand
- Long-life battery
- Limited Warranty

Choose from these dynamite colors: signal yellow, anthracite gray or jet black. Available for only \$29.95 each. Order yours today!

Credit-card orders only,
call TOLL-FREE:

1-800-243-6685

In CT: 203-834-2900.

Postage and handling: U.S.: \$2.95 for first item; \$1 for each additional item. Foreign, Air Mail (including Canada and Mexico): \$5.50 for first item; \$2.50 for each additional item. Foreign payment must be made in U.S. funds drawn on a U.S. bank, or by international money order. Foreign, Surface Mail (including Canada and Mexico): \$3 for first item; \$1.50 for each additional item. Connecticut residents add 8% sales tax.

Air Age Mail-Order Services, 251 Danbury Rd., Wilton, CT 06897
Use our handy order form on page 117.



FAIRCHILD 24

(Continued from page 108)

ened the needle setting occasionally to prevent potential overheating. With the muffler spring still in the wide-open position, the little .049 really sang. Closing the spring reduced some of the shrill, typically $\frac{1}{2}$ A note, but it claimed some power also. Since our field is fairly isolated, I decided to leave the muffler open to take advantage of all the power.

After refueling and firing-up again, I grabbed the F-24 in my left hand, the Cobra transmitter (with a little up-elevator trim dialed-in) in my right, trotted into the wind and released the Fairchild with a gentle shove, slightly nose high. It settled ever so slightly, resumed its climb and headed straight out, still into the wind.

In spite of its chunky proportions and the fact that it has only elevator and rudder controls (no ailerons or throttle), the little Fairchild flies remarkably well. It's docile, and I agree with Cox in their assessment that it's for intermediate fliers. With proper instruction, a beginner could fly it but, like most small airplanes, it must be flown close to you to maintain orientation, and this is one of the biggest problems confronting new fliers. This "in-close" requirement reduces the margin for error—not a desirable quality when you're learning to fly.

The absence of a throttle and ailerons took some getting used to, especially when I tried to set the Fairchild up for flight shots, but eventually, I positioned the airplane where it was necessary. Having only two channels makes you rethink some of your flying habits—especially if dead-stick landings make you uncomfortable! The absence of a throttle control on the .049 makes every landing fall into this category, but the F-24 handles these easily. It has a great glide with not too much sink, and it allows you to set up properly for landing without penetrating the next county's airspace! Can you imagine actually learning something from a decidedly simpler and smaller airplane!

Although our field has a blacktop runway, I haven't tried to ROG (rise off ground) the little Fairchild because, in addition to the lack of throttle control, no provision is made for a steerable tail wheel. That really doesn't bother me because the fields to which it's ideally suited are generally small surfaces—the type that $\frac{1}{2}$ A R/C is all about anyway!

Cox Hobbies has done a great job with

(Continued on page 116)

MODEL AIRPLANE NEWS DECALS

By popular demand, we now have 4"x6" sheets of assorted Model Airplane News Decals for your R/C plane. These high-quality, pressure-sensitive decal sheets come in ten different colors. Each color sheet is \$2, which includes postage and handling.



Please send me _____ decal sheets in

☐ Black ☐ Red ☐ White ☐ Gold ☐ Blue ☐ Day-Glow Red ☐ Day-Glow Yellow
☐ Day-Glow Blue ☐ Day-Glow Pink ☐ Day-Glow Green

I have enclosed \$ _____

Name _____

Address _____

City _____

State _____ Zip _____

Foreign payment (including Canada and Mexico) must be made in U.S. funds and drawn on a U.S. bank, or by international money order.

MODEL AIRPLANE NEWS Decals, 251 Danbury Rd., Wilton, CT 06897



KRESS JETS

914-336-8149 • 914-336-5975 FAX

F-15 EAGLE FOR
RK-709 SPORT
& RK-720
\$156.99



- ULTRA - SIMPLE MODEL
- A VERY COMPLETE KIT
- Balsa COVERED FOAM CONSTRUCTION
- FORMED INLET DUCTS
- SEND FOR PLANS \$5.00; WILL BE CREDITED TO PURCHASE

DEALER INQUIRIES INVITED
SEND FOR 1990-1991 CATALOG \$3.00

4308 ULSTER LANDING RD. SAUGERTIES, N.Y. 12477

F-16 FOR RK-709 SPORT



BOSS 602 \$129.50
THRUST 11.0 LB

RK709
THRUST
1 1/2 - 2 LB
\$55.00



- ALL NYLON & VIVAK PLASTIC
- TRANSPARENT SHELL
- MULTI-DISPLACEMENT ENGINE APPLICABILITY
- EXTERNAL CARBS AVAILABLE
- VERY SIMPLE ASSEMBLY

RK-740 \$109.50
THRUST 7.0 LB



RK-720 \$99.50
THRUST 3.5 LB

ATTENTION CANADIANS!

Byron Original Products in Canada...

At Factory Direct Prices!

A complete catalogue (including a full color Byron Originals) is available for \$5.



For more information call or write

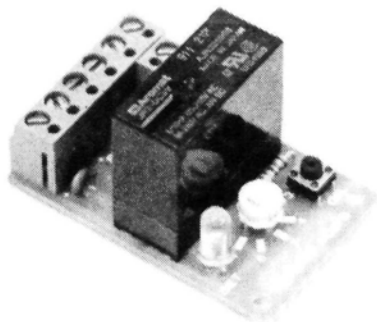
ALBERTA'S LITTLEST AIRPORT

Box 6, BAWLF, Alberta, Canada T0B 0J0

(403) 373-3953

PRODUCT NEWS

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Model Airplane News, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Model Airplane News.



POWER-GRAPHIX Battery Switcher

Power-Graphix now offers a new Battery Switcher (Model PX-2A). Battery switchers eliminate "Y" cables or parallel connections, which can shorten battery life if they aren't properly matched. Extended running time of R/C cars, boats and airplanes is achieved by automatically switching to a redundant (spare) battery pack when the first pack reaches a preset cutoff voltage, which is adjustable from 3 to 7 volts. The unit has a built-in LED "Set" indicator and an alarm circuit for a buzzer, a horn, or a high-intensity lamp that warns the operator that cut-off occurred. Built-in quick-connect/disconnect terminals make installation a snap. The PX-2A can also be used as a battery-charge-capacity tester and to condition batteries. Dimensions: 2x1¹/₄x1¹/₄ inches; weight about 1¹/₂ ounces.

Price: \$19.95 (fully assembled); \$12.95 (kit)

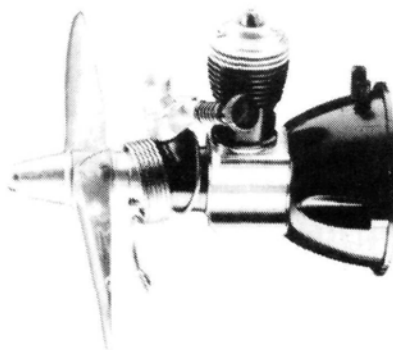
For more information, contact Power-Graphix, 475 Graphic Blvd., New Milford, NJ 07646.



BOB SMITH INDUSTRIES Super-Gold™ and Super-Gold+™ Adhesives

Bob Smith Industries introduces two new additions to its extensive line of hobby adhesives. Super-Gold thin CA and Super-Gold+ gap-filling CA are the odorless equivalents of Bob Smith's Insta-Cure™ CAs. The new glues don't give off the usual CA fumes that can irritate modelers' lungs and eyes. The Super-Golds bond faster than the other available odorless CAs, and they take only a few seconds longer than regular CAs. They won't attack white foam, and they won't fog clear plastic. They cure to a flexible consistency for better shock absorption.

For more information, contact Bob Smith Industries, 8060 Morro Rd., Atascadero, CA 93422.



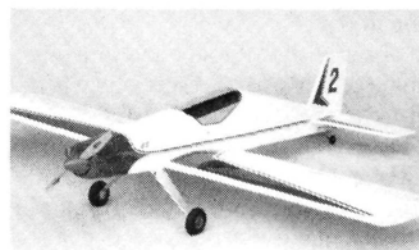
COX HOBBIES Tee Dee .010 Engine

One of the oldest producers of model aircraft engines in the U.S., Cox Hobbies is proud to announce the reappearance of the world-renowned Tee Dee .010! First introduced in 1961, the Tee

Dee series initially included engines of .010-, .020-, .049-, .051- and .15-cubic-inch displacement. With the addition of the Tee Dee .09 in 1962, 14 special, small, model aircraft engines were available from Cox.

Following requests from modelers who love to build and fly "briefcase-size" models, the world's smallest model engine is again available. It still features the same high performance, but it's now finished with a natural, anodized crankcase that's set off by a black, molded, intake body and tank mount. The special Cox wrench, propeller, starter spring and instructions are also included.

For more information, contact Cox Hobbies, Inc., 350 W. Rincon St., Corona, CA 91720.



CARDEN CORP. Sidewinder

Carden Corp. has introduced another sport/aerobatic design. For intermediate and advanced pilots, the Sidewinder is a solid, fully aerobatic model with a wide speed range and slow, predictable landings. With very few parts, the kit is relatively easy to build straight, strong and true. (Many modelers are ready to cover this model in only eight hours.) The kit has precision-cut wooden parts, foam wing-cores with balsa-sheeting, customized ailerons, a generous hardware package and customized, polished-aluminum landing gear. The rolled plans are easy to read, and the detailed instruction manual includes construction photos. Have fun building and flying the Side-

winder. Specifications: 56-inch wing-span; 700-square-inch wing area; weighs 6 to 7 pounds; 20- to 23-ounce wing loading; takes a 60 to 91 4-stroke or a 40 to 61 2-stroke.

Price: \$99.95 plus \$5 S&H

For more information, contact Carden Corp., 1731 N.W. Madrid Way, Boca Raton, FL 33432.

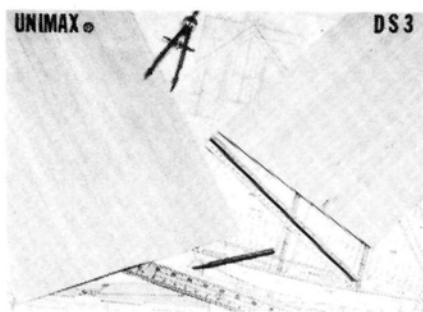


PANCO HOBBIES WW II Scale Pilots

Panco Hobbies introduces its light, tough, 1/5-scale U.S. Navy pilot, who comes with separate parachute pack and harness straps and a detailed painting guide to ensure authenticity. This great addition to your model is available at your local hobby shop or from the manufacturer.

Price: \$28.95

For more information, contact Panco Hobbies, 1865 Penfield Rd., Penfield, NY 14526.



BALTEK Unimax and DS3

Baltek introduces its new, extra-wide, uniquely uniform balsa sheets. The introduction of Unimax® and DS3® results from the company's proprietary, innovative processing of the finest, certified-kiln-dried balsa wood—an industry first. Each sheet of Unimax is produced from a single balsa board that's precision-cut into thin sheets. All

the sheets from a particular board are "book-matched," "spliced" and smooth-sanded to provide a consistency and surface finish that enables designers and modelers to achieve superior finishing touches, but spend less time on preparation.

Successive matching and splicing of model-grade balsa is done until widths of up to 20 inches, thicknesses of 1/6, 3/32 and 1/8 inch (with tolerances of ± .005) and standard lengths of 29, 35, 41 and 47 inches are achieved.

SA3 (Density Selected Spliced Sheet), is just like Unimax, but the sheets aren't made from the same board. The individual pieces are all density controlled within a narrow range.

For more information, contact Baltek Corporation, 10 Fairway Ct., Northvale, NJ 07647.



U.S. AIRCORE AirCore 40™ Trainer

The AirCore 40™ family trainer is a full-size, U.S.-made, Fold & Fly Technology™ R/C model aircraft kit for the first-time builder/pilot. This kit is made of super-durable AirCore™ material that's precision die-cut, scored, decorated and ready to "fold up." The plane, which is compatible with AirCore's Power Cartridge™ system, features a 64-inch, high-lift wing and a "Fold & Fly" building system that gets the modeler to the flying field quickly.

If you damage your AirCore 40 beyond repair before you learn to solo, the company will send you a replacement kit—FREE! To qualify, you must learn to fly under the direct supervision of an AMA club instructor who must return the damaged plane to AirCore's labs for inspection, along with an affidavit signed by him and the modeler.

AMA members only: if you damage your engine or radio beyond reasonable repair while you're flying your AirCore

40, U.S. AirCore will replace it free of charge. This guarantee applies to planes bought before March 31, 1991, and the program is valid through December 31, 1991. (Certain restrictions apply. Send for full details of program.)

Price: AirCore 40, \$119.95; Infopak, \$3; Video, \$12

For more information, contact U.S. AirCore, 4576 Claire Chennault, Hangar 7, Dallas, TX 75248.



HOBBY DYNAMICS 4- and 6-Channel Radios

Announcing the newest members of the JR radio line!—the Max 4FM and Max 6FM systems (shown above). Both have an ABC&W, 7-channel receiver that increases flexibility and a trainer function that makes learning easier and safer. The company's proven 1991 Super Narrow Band transmitters ensure high-quality performance for years to come. The Max 4FM and Max 6FM radios come complete with JR507 servos (three and four, respectively); plug-in, rechargeable transmitter battery pack and airborne Ni-Cds; a Ni-Cd charger; and complete servo accessories and hardware. Each has servo-reversing, and the Max 6FM also features dual rates, a three-position flap switch and a retract switch.

Part nos. J4FC2 (Max 4FM); J6F22 (Max 6FM).

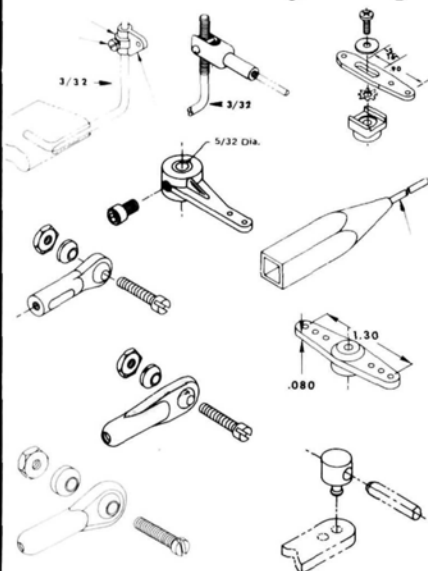
Price: \$249.99; \$319.99.

For more information, contact Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826.

ROCKET CITY SPECIALTIES



We can hook you up!



Free Catalog

of our linkage accessories.

Prices increase 2-1-90

103 Wholesale Avenue N.E.
Huntsville, Alabama 35811

FAIRCHILD 24

(Continued from page 111)

this model, and I guess my concerns about the instructions aren't such a big deal. They're still superior to some I've seen, but if the wheel-pant/landing-gear installation illustrations were clearer, it might eliminate any confusion for modelers with limited experience.

The separate "Pocket Flight Instruction," however, is excellent, and it includes all the appropriate information, i.e., troubleshooting. The "Video Copilot" tape is a great idea and one that other manufacturers should consider. Don't let the list price of the airplane scare you—you can buy it for considerably less. The F-24 will provide you with many hours of good 1/2A fun, and who knows more about 1/2A fun than Cox Hobbies?

*Here are the addresses of the companies mentioned in this article:

Cox Hobbies, Inc., 350 West Rincon St., Corona, CA 91720.

Ritch's Brew; distributed by Ritch's Hobbies, 4104 Lark Lane, Houston, TX 77025.

Hobbico Products; distributed by Great Planes Model Distributors Co., P.O. Box 4021, Champaign, IL 61824.

John Pond Old Time Service, P.O. Box 90310, San Jose, CA 95109.

Gleason Enterprises, 1106 Tenth Dr. S.E., Austin, MN 55912.

R/C WARBIRDS

(Continued from page 90)

observation plane. While stationed at Fort Drum in upstate NY, I flew as an observer in the L-19, so it brought back memories. Bob's model was built from a Marutaka kit that was distributed by Circus Hobbies. The model has fully operational flaps, uses an O.S. .90 engine and is finished with Pactra flat, military spray paint. Bob used an Airtronics 7SP Module R/C system.

Other models worth mentioning are: Gordon McCallas's Percival Provost MK-1; Phil Corso's second entry—a Byron P-40; Al Feltault's Balsa USA Bristol Bullet; Page Holm's second entry—a Royal Stuka dive bomber; Bill Johnson's scratch-built, giant P-39 Airacobra; Tom Stryker's Great Planes AT-6 and Arnold Marcus's Byron P-47 Thunderbolt—a large variety.

The feedback from pilots and spectators was very positive, and I'm already making plans for next year. Till then, stay well and keep 'em flying!

Thanks go to these manufacturers and hobby dealers who supported the Fly-In:

Airtronics Inc., Futaba Corp. of America, World Engines, Sig Mfg., Top Flite Models, Carl Goldberg Models, S&R Batteries, Ace R/C Products, RC Video Report, Coverite, Du-Bro, Hobby Dynamics, Lanier R/C Model Products, Ernst Mfg., Satellite City, Firenze Hobby Center (Winter Springs, FL), Bob's Hobby Center, Colonial Photo and Hobby, and The Hobby Box (all in Orlando, FL).

REALISTIC PILOT FIGURES

All Figures Available Now!

1/3 Civilian • 1/5 US Navy
1/4 Civilian • 1/6 & 1/6 AAF
1/5 Civilian • 1/4 RAF
1/3 - 1/4 - 1/5 Bust

\$19.95 & \$4 UPS

\$7.95 & \$3 UPS - Bust

Phone 201-996-4414

KNIGHTS OF THE AIR, INC.

P.O. Box 187 • Pittstown, NJ 08867

BUILDING MODEL PLANES

(Continued from page 86)

recently published designs excepted, of course). John has a complete line of yesteryear's R/C and scale model plans.

• Gleason Enterprises'* small catalogue contains such a wealth of model-plan listings that it's a little hard to decipher. The effort to do so can be rewarding, however, because Dick Gleason's firm offers unique services. It can reduce or enlarge plans to the size you want, and it's the exclusive source of full-size plans for models published years ago in *American Aircraft Modeler* and *Radio Control Sportsman* magazines.

None of the catalogues I've mentioned costs more than \$3. At twice the price, they'd still be well worth it for the wealth of useful data in them!

*Here are the addresses that are pertinent to this article:

Sig Manufacturing Co., Inc., 401 South Front St., Montezuma, IA 50171.

Tower Hobbies, Inc., P.O. Box 778, Champaign, IL 61820.

Ace R/C, Inc., P.O. Box 511, Higginsville, MO 64037.

Penn Valley Hobby Center, 837 W. Main St., Lansdale, PA 19446.

Old-timer Model Supply, P.O. Box 7334, Van Nuys, CA 91409.

CONDOR 60

(Continued from page 95)

and I never had a crash caused by belt failure. I didn't get a Hirobo Stork or a Stork SE when they first came out, but Allen Dye, who put a metal rotor head on the Stork mechanics, told me that belt drives perform just as well as wire drives. GMP's Legend and Legend Elite offered after-market metal heads with belt-driven tails. Hirobo has designed its top-of-the-line mechanics in the Hawk (no longer available), Condor and Eagle to accept either wire or belt drives.

The recent trend toward substituting stainless-steel or graphite torque tubes for drive wires has minimized vibration and whip in conventional tail booms, but set-

(Continued on page 119)

MILITARY MEMORABILIA



Dress up your displays with Pilot Jackets, CWU-type, with leather nametags and 4 patches \$86. T-Shirts \$15. Wings \$8. Patches \$6.50 + .50 p/h each patch. Many Squadron sets, hat pins, flight helmets, artwork. Catalog \$2. Color catalog and "one of a kind" list \$5. COD's ok! Ground forces catalog also available. SASE for free brochure, or call 602-964-0794.

F-117A STEALTH FIGHTER

Patches (over 15 designs) \$7.50 ea. + .50 p/h per patch. Check out our selection of F-117A T-Shirts, summer and winter ballcaps, photos, license plates, pins. SASE for FREE Stealth brochure, or call 602-964-0794.



OWMC Dept. MAN • 136 E. 7th Drive • Mesa, AZ 85210

CONDOR 60

(Continued from page 116)

ting the proper alignment and mesh at two 90-degree gear sets still drives many pilots crazy (not to mention having the set-screws in couplers coming undone!).

In a toothed-belt system, it's relatively easy to set the mesh for the counter gear because it's in the same plane as the main gear. There's only one 90-degree change-of-power direction, and that's accomplished by the quarter-turn twist of the belt inside the tail boom. The only remaining adjustment is to the belt tension.

Getting the power to the rear isn't the weak link in the tail-rotor system: belt tail-rotor drives are powerful and reliable enough to call for triple-bearing, tail-rotor blade grips in high-rpm, high-performance applications—just like wire or shaft drives. At moderate head speeds of 1,300 to 1,500rpm, the Condor's single-bearing tail-blade grips work well.

I got just what I expected out of the Condor's belt-driven tail. It's powerful enough to do constant-rate pirouettes in high winds, and with it, I can stop yaw movement on a dime. I can also perform much better 540 stall turns than with my trusty Champion!

It's no surprise that the Condor performs fast, large-radius aerobatics very well. It has the same rotor-disc size, side-frames, drive-train layout, gearing and collective mechanism as the World Champion Hirobo Eagle. Mike Mas recently placed 2nd in the Schluter Cup with a Condor that's fitted with some Eagle parts (his used the SSZ rotor head), and between rounds at the recent Mid-American Nats, Seiji Suwabe demonstrated some radical maneuvers with a Condor.

The big surprise with the Condor—and the reason I smile whenever I fly it!—is

(Continued on page 124)

Authentic Scale Instrument Kits for • Planes • Boats • Cars •



- Over 83 assorted instruments including first time ever, WW I
- 20 Instrument bezels with clear plastic faces.
- Available from 1/3 to 1/12 scale from \$5.50 to \$8.50 retail.

1/3	11/16" & 1"	8.50	1/8	1/4" & 3/8"	5.50
1/4	1/2" & 3/4"	8.50	1/9	7/32" & 5/16"	5.50
1/5	3/8" & 5/8"	6.50	1/10	3/16" & 5/16"	5.50
1/6	5/16" & 1/2"	6.50	1/12	5/32" & 1/4"	5.50
1/7	9/32" & 7/16"	6.50			

At your hobby shop or ORDER DIRECT. Check, MO, Visa, MC \$2.50 for UPS.

JTEC 164 School St. • Daly City, CA 94014
phone: 415-756-3400

Ultimate Hobbies Presents:

ULTIMATE EXPOXY STATION

NO HOBBYIST
SHOULD BE
WITHOUT IT!



ALL YOUR
EXPOXYING
NEEDS IN
ONE PLACE!

FEATURES:

- 1) Quality aircraft birch plywood (pre-cut)
- 2) Inverted epoxy bottle holder
- 3) Mixing stick holder and 10 mixing sticks
- 4) Mixing pad
- 5) Easy-to-assemble kit

The ultimate epoxy station is only \$5.95 each. To order, send your name and address, along with your check or money order

To: **Ultimate Hobbies**
2232 12th Street, #118
Everett, WA 98201

Add \$2.00 for S/H; in Washington, add \$0.46 Sales Tax.
Allow 4-6 weeks for delivery Epoxy not included



BUILD YOUR OWN ROCKET MOTORS!

WE CAN SHOW YOU HOW!

- 40 POUNDS THRUST!
- 50¢ EACH!

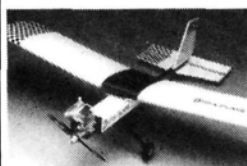
• With a rock tumbler and some simple hand tools, we'll show you how to build **YOUR OWN** rocket engines in your own garage or workshop for 1/5 to 1/10 the cost of the commercially marketed motors.

• **INTERESTED?** Just send us \$2.00 and we'll mail you our brochure along with a **WORKING SAMPLE** of an electric igniter that **YOU CAN MAKE YOURSELF** from materials you'll find around the house.

TELL YOUR FRIENDS ABOUT US! We're the **DO IT YOURSELF ROCKET** people.

Write to: **The Teleflite Corporation**
Department MN
11620 Kitching Street
Moreno Valley, CA 92387-9978

The Dynamic Duo of Durability Stand Ready to Help You Take on All Encounters With the Planet Earth



DuraPlane II
.25-size, 3-channel
basic flight trainer.

A scuffle with the ground isn't something you should have to face on your own. You may have gotten into it on your own, but don't you think your model should stand by you? After all, the two of you are a team. So join up with the airplanes that'll stick by you through thick and thin!

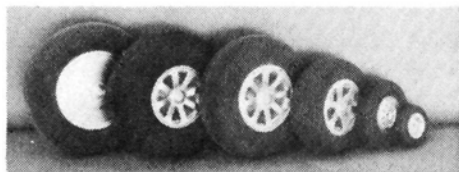


1007 Orchard Grove Drive
Royal Oak, MI 48067



DuraBat
.40-size, 4-channel
aerobatic trainer.

Precision Scale Wheels & Tires



Custom designed aluminum wheels designed to carry the weight of today's heavier aircraft. We can manufacture wheels & tires for whatever aircraft you have including scale appearance & tread.

Starting at **\$85⁰⁰**

**Length 65
Span 57
5-9 Channel**

Semi kit includes fiberglass fuse, foam surfaces, intake-outlet ducting, canopy, full size plans & instructions.

\$189⁰⁰ INTRODUCTORY PRICE



F-100 D for Dynamax Fan



FOR MORE INFORMATION CALL OR WRITE:

(916) 742-3957 — 1-800-688-3957
5528 Arboga Road, Linda, CA 95901

SMALL STEPS

Enya 11CX, O.S. 12CZ & electric break-in tips

by RANDY RANDOLPH

A FEW MONTHS AGO in this column, we bragged about the great Super Tigre X11, and now I understand that it's no longer in production. If you can find a dealer who still has one in stock, buy it! You won't be disappointed.

There are other high-performance, .10- to .12-size engines available that can act as replacements for the ST, including the Enya* 11CX and the O.S.* 12CZ. These engines were originally designed for cars, but they're now available for aircraft use.

The Enya 11CX is a double-ball-bearing engine with Schnuerle porting and a chromed-aluminum piston and sleeve. According to factory specifications, its rpm are in the 17,000 range with a 7x3 prop, and with a muffler, it weighs just over 4½ ounces, which is very good for .10-size engines. Enya engines have a reputation for durability; it has been said that they really don't perform their best until they've been run long enough to turn brown!

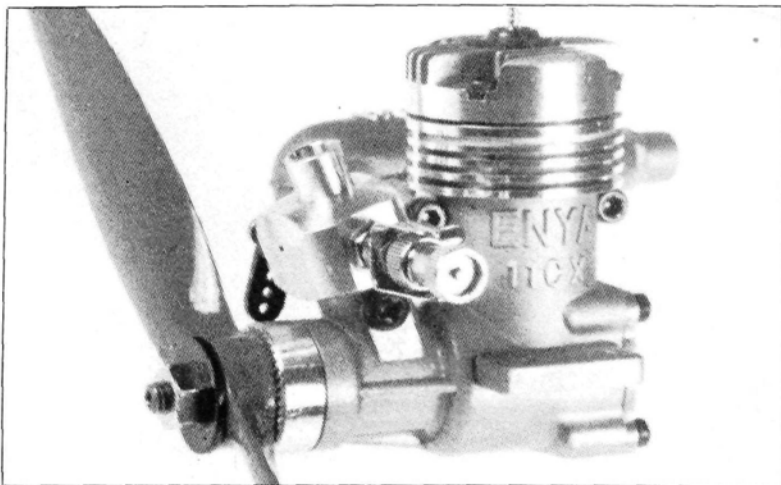
Information on the O.S. 12CZ aircraft engine isn't available yet, but it shouldn't be long in coming. The O.S. 10FP has been around for years, and it's probably the most popular .10-size engine in the country. While not the hottest engine in its class, it does

have Schnuerle porting and gives consistently good performance for a reasonable price.

WELL WORTH IT

Most electric motors fall into the "Small Steps" category, and they're not only quiet, but also clean and inexpensive to operate. A good electric motor, battery pack and rapid charger for a small plane usually cost no more than a glow engine and fuel tank of comparable

size. There's obviously no need to keep paying for fuel; just recharge the battery pack from a car battery or your shop's wall outlet.

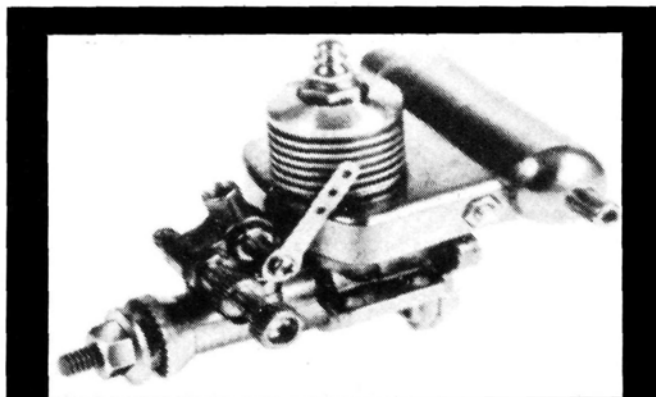


The Super Tigre X11 is no longer available, but the Enya 11CX is a good alternative.

BREAKING IN

Electric motors must be broken-in, because before they can deliver full power, the brushes must "seat" on the armature (i.e., they must be smooth and conform to its circular shape). The suggested way to break-in a motor is to run it without a load at a reduced voltage for several hours.

During this treatment, high-performance motors tend to run very hot. Someone suggested that they be broken-in under water to dissipate the heat and the carbon that's worn off the brushes as they settle against the armature. Nothing ventured, nothing gained! I hooked a 1½V dry cell to a new AP29, completely submerged the motor in a coffee can full of iced water, and allowed it to run until the battery was exhausted.



The .049-II TV engine is rarely seen in this country. According to Enya specifications, its performance with throttle and muffler is from 2,500 to 18,000rpm with a 6x3 prop, and it weighs 2.2 ounces. Numbers like that would make it competitive with just about any production .049! If you've had any experience with this engine, send us your comments. The "Small Steppers" here at MAN would like to know what you think.

SMALL STEPS

Five hours later, the water was still cool, but the bottom of the can was covered with fine carbon dust, and the armature was as bright and shiny as a new penny! I applied a little oil to the bearings and then ran the motor with a 3V supply until it was dry. It's now very smooth and very strong. Underwater break-in might sound odd for an electric device, but in this case, it was just the ticket.

SOME SERVICE!

To drive the gear chain and servo arm, very small servos like the Futaba* S33 series use small coreless motors—the kind



A Futaba S33 servo. Notice the dates on the invoice!

that's used in automatic cameras to open and close the shutter or adjust the focus—because they react almost instantly to the voltage applied.

When the motor in the Futaba S33 servo shown in the photo started to perform erratically, I sent it to Futaba for service. Notice the date on which it arrived at the Futaba service center and the date of the invoice, which was actually the shipping date. The servo was mailed by regular mail on Saturday, July 21 (the day it failed). It arrived at Futaba on Monday, was repaired and mailed back by Wednesday, and I received it on Friday—in time for the next Saturday's flying session! That's what I call service!

*Here are the addresses of the companies mentioned in this article:

Enya, distributed by Altech Marketing, P.O. Box 391, Edison, NJ 08818.

O.S. Engines/Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

HAWKER HURRICANE

THE RAF WAS GLAD TO HAVE THE SPITFIRE, BUT IT HAD TO HAVE THE HURRICANE.

\$249.95

Order direct. Add \$15.00 for shipping. Use VISA or MC, check, money order or C.O.D.



- ✓ Polyester Hand Laid Fiberglass Fuselage
- ✓ Complete Balsa and Hardware Packages Included
- ✓ Machine Cut Foam Wing Cores
- ✓ Heavy Duty Styrene Clear Canopy
- ✓ Fiberglass Cowling
- ✓ Easy To Build...Easy To Fly

- 1/6th Scale
- Wingspan...80 Inches
- Fuse Length...63.33 Inches
- Weight...12 To 15 Lbs
- Power...2cy.90 To 1.08 4cy 1.20
- Imma Legal
- Fuse Has Molded Stringers
- Excellent Beginners Warbird

INNOVATIVE MODEL PRODUCTS

P.O. BOX 4365
MARGATE, FL 33063
(305) 978-9033

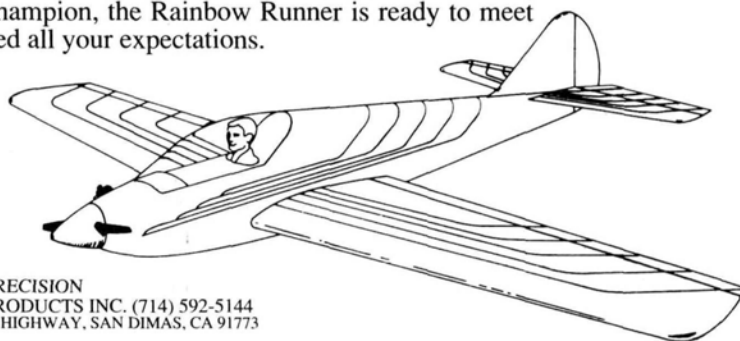
Accessories Available • Static Pops • Static and Flying Spinners • Scale Tires and Hubs • Ultra Light Pilots • Retracts • Scale Landing Gear Legs • Other 1/16 Kits Available • Focke Wulf 190-d • Focke Wulf 190a Thru G Power...2cy.90 To 1.08 4cy 1.20 • Jets Fun Scale Sab G Gripen

NEW KITS COMING SOON
P.51, P.47, ME-109F-98,
SEND \$3.00 FOR CATALOG
REFUNDABLE WITH ORDER

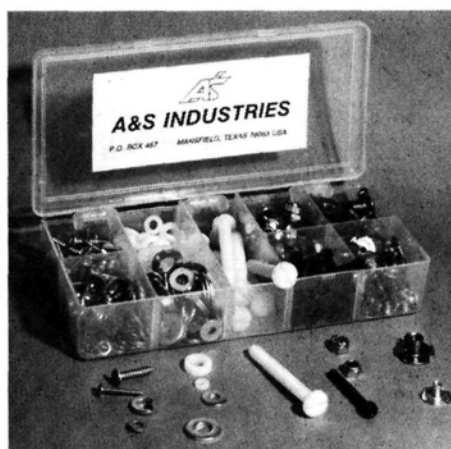
PHONE ORDERS
1-800-780-F190

"RAINBOW RUNNER: PURE PERFORMANCE"

The Rainbow Runner delivers total pattern performance in .25 and .45 sizes. Designed with all the features of a pattern champion, the Rainbow Runner is ready to meet and exceed all your expectations.



Gm PRECISION
PRODUCTS INC. (714) 592-5144
510 E. ARROW HIGHWAY, SAN DIMAS, CA 91773



MODEL AIRPLANE HARDWARE KIT

Why pay high hobby shop prices?
Buy direct and save up to 70%

Model aircraft screws and nuts often vibrate loose. Don't be caught in the middle of a project short on hardware! Our time-saving, money-saving hardware kit has more than 500 of the most used fasteners in 34 different sizes in a plastic compartmented kit with a snap-shut lid. Retail value at a hobby shop more than \$40, but yours for only \$12.50 during introductory offer, plus \$3 s&h. Money back guarantee. Send for our free brochure of hobby supplies.

A & S INDUSTRIES
222 North Willow, P.O. Box 457
Mansfield, Texas 76063



"Matched Performance System" for TOP PERFORMANCE

K&B ENGINES
Airplane Marine

K&B FUELS K&B GLOW PLUGS
9 Blends 4 Choices

"Matched Finish System" for BEST APPEARANCE

K&B FIBERGLASS CLOTH K&B Micro-Balloons FILLER
K&B SUPER POXY RESIN K&B SUPER POXY THINNER
K&B SUPER POXY PRIMER
K&B SUPER POXY PAINT
K&B MIXING CUPS

**NOTE
NEW
ADDRESS**



K&B MFG. Inc.
2100 COLLEGE DRIVE
LAKE HAVASU CITY, AZ 86403

NEED THE REAL THING?

U.S. MILITARY & CIVILIAN

FLIGHT CLOTHING

- EMBLEMS & INSIGNIA
- JACKETS
- FLYING SUITS
- HELMETS
- PARACHUTES
- LEATHER JACKETS
- FULL LINE OF NOMEX APPAREL
- COMMUNICATIONS
- SURVIVAL GEAR
- ACCESSORIES
- GLOVES
- G-SUITS

ALL NEW MANUFACTURE
CURRENT MILITARY ISSUE

WATKINS AVIATION, INC.
15770 MIDWAY RD. HANGAR #6
ADDISON, TX 75244
214/934-0033



FREE ILLUSTRATED CATALOG
To U.S. Zip Codes

FOAM WING CORES

PRECISION MADE EXPANDED BEAD POLYSTYRENE REPLACEMENT WING & STAB CORES FOR ALL POPULAR R/C AIRCRAFT. OVER 350 DIFFERENT WINGS IN STOCK FOR IMMEDIATE DELIVERY. SO IF YOU HAVE A FAVORITE BIRD THAT NEEDS A WING CALL OR WRITE US.



LOTS OF ARF WING CORES

Don't trash it after you crash it!

Phone 309-342-3009

Send \$4.00 for catalog

WING MFG

306 E. Simmons
Galesburg, IL 61401

IPMS Color Cross-Reference Guide

- Over 2400 aircraft colors cross-referenced to the FS 595 color chips; 63 countries, from 1907 to the present

- Your best source of scale color documentation !!!



\$21.95 Guide only
\$31.95 Guide & FS 595
Fan Deck

(Postpaid in US ONLY - non-US write first)

David H. Klaus (Dept 400)
3404 Ramsage Terrace
Alexandria, VA 22309-2142

CONDOR 60

(Continued from page 119)

that the FFZ rotor head inspires confidence in aerobatic and hovering maneuvers. If you read my articles regularly, you know I'm not a radical hot-dog pilot. Split-S's are my best aerobatic maneuver, and I have trouble doing good rolling stall turns consistently. I do a tiny bit of switchless inverted up high, but I don't practice it regularly.

My thing is balletic, flowing orientation maneuvers like the old high-K-factor FAI hovering maneuvers, traveling and circling piroettes and exterior lateral circles. I've flown Champions, Concepts, Shuttle ZXs—and now Condors—more than snappier types like Cobras, Competitors, Heims and X-Cells.

I like to do large-radius aerobatics and to avoid sudden or jerky movements. What I want most out of a helicopter is stability when it's rapidly changing aspect, and I absolutely love the way the Condor head feels! It makes my maneuvers look better.

The FFZ head has a single feathering-axle design with a molded yoke, a machined-aluminum hub, steel pitch-control arms, a metal seesaw and metal mixing levers. These components align perfectly with one another, but they aren't the reason for the Condor/FFZ's characteristic feel. The Condor's feathering dampers are huge: they're larger, thicker and stiffer than anything I've seen in a rotor head. For example, damping in a Champion is accomplished with 11mm-diameter O-rings; the Condor uses 19mm elastomeric donuts.

I wish I knew more about polymers and compressibility coefficients so I could tell you why the FFZ head works so well. The best analysis I can come up with is that the Condor dampers work progressively, or with variable rate. As flying loads in the head build up, say, in a violent approach from fast forward flight to a hover, or as G's increase when the heli pulls out of a dive, the damping stiffens. Call it "damping on demand"—softer in the hover, harder when boogying upstairs.

Hirobo's engineers have come up with a great combination of paddles, blades and damping that allows the forces of a tilting, whirling rotor disc to be transmitted to the main shaft smoothly and beneficially. If helicopters were race cars, this ship would have Konis, ABS and active suspension.

The Condor offers a broad performance

envelope that should satisfy pilots who hot-dog, hover, or compete. If you don't mind the extra expense, you can get the fully-adjustable SSR-II rotor head with Hirobo's top-of-the-line Eagle, but the Condor and its FFZ head can serve most pilots as a number-one machine. R/C heli fliers who value smooth-looking maneuvers and want to be good at a little of everything will enjoy this ship. Congratulations to Hirobo for designing such a nice-flying helicopter!

*Here are the addresses of the companies mentioned in this article:

Altech Marketing, P.O. Box 391, Edison, NJ 08818.
Tetra/Vortex Precision Products, 221 S. Magnolia No. C, Anaheim, CA 92804.

O.S. Engines/Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

Hatori/Golden Gate Hobbies, P.O. Box 27001, Fresno, CA 93729.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

GIANT STEPS

(Continued from page 21)

Again, if you have a shop in your area that uses it, they might give you their offcuts free.

COVERING MATERIALS

My first large model (built back in 1975) was a J-3 Cub from the Sid Morgan plan. There were a few of them around at the time, and most were flying with one of Duke Fox's .78s. On floats, that Cub was a bit of a dog. I used one of the first Q35s in mine, and it was a real performer! I built the plane almost entirely out of substitute materials, and its airframe cost less than \$30! I covered the bird, however, with one of the best iron-on covering materials, and the cost of covering it was more than double that of the airframe!

After some experimentation, I hit upon what has become my favorite method of covering a large model. I use glider-grade Dacron® or Ceconite®. They weigh only a few ounces per square yard and cost only a few dollars.

These materials shrink by almost 25 percent, so you can easily do a superb covering job. I make a sleeve or sock that slips snugly over the fuselage. To prepare the fuselage for covering, I apply one of the heat-seal adhesives, then I seal the sock securely to the firewall and the tail post and heat the covering. It shrinks tightly to the contours of the underlying structure. After the shrinking, I use acetone to activate the heat-seal adhesive,

(Continued on page 126)

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685)			
1. TITLE OF PUBLICATION Model Airplane News		2. PUBLICATION NO. 00 2 6 7 2 9 5	
3. FREQUENCY OF ISSUE Monthly		4. DATE OF THIS STATEMENT 10-01-90	
5. COMPLETE MAILING ADDRESS OF THE PUBLISHER (Street, P.O. Box, and ZIP+4 code)		6. ANNUAL SUBSCRIPTION PRICE \$24.95	
7. COMPLETE MAILING ADDRESS OF THE HEADQUARTERS OF GENERAL BUSINESS OFFICES OF THE PUBLISHER (Street, P.O. Box, and ZIP+4 code)			
8. FULL NAMES AND COMPLETE MAILING ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR (This form must not be blank)			
PUBLISHER (Name and Complete Mailing Address) Dr. Louis V. DeFerdinando, 251 Danbury Road, Wilton, CT 06897			
EDITOR (Name and Complete Mailing Address) Thomas Atwood, 251 Danbury Road, Wilton, CT 06897			
MANAGING EDITOR (Name and Complete Mailing Address)			
9. OWNERS (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a sole proprietorship, its name and address must be given. (This must be completed)			
10. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES (Section 412 (2) (B) only) (The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes: Check one) <input type="checkbox"/> (1) NOT CHANGED DURING PRECEDING 12 MONTHS <input type="checkbox"/> (2) HAS CHANGED DURING PRECEDING 12 MONTHS <input type="checkbox"/> (3) CHANGED PUBLISHER (must submit explanation of change with this statement)			
11. EXTENT AND NATURE OF CIRCULATION (Check one)		12. AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	
A. TOTAL NO. COPIES (See Form 3500)		120,518	
B. PAID AND/OR REQUESTED CIRCULATION (Sum of 12B and 12C)		32,392	
C. TOTAL PAID AND/OR REQUESTED CIRCULATION (Sum of 12B and 12C)		29,382	
D. FREE DISTRIBUTION BY MAIL, CARRIER OR OTHER MEANS (Samples, complimentary, and other free copies)		5,692	
E. TOTAL DISTRIBUTION (Sum of 12D and 12E)		70,256	
F. COPIES NOT DISTRIBUTED (Office use, left over, unsolicited, spoiled after printing)		1,720	
G. RETURN FROM NEWS AGENTS		43,057	
H. TOTAL (Sum of E, F, and G) (Should equal net press run shown in 11)		108,375	
I. COPIES OF THIS STATEMENT MADE BY ONE PERSON ARE CORRECT AND COMPLETE		120,518	

PS Form 3526, July 1989

(See instructions on reverse)

CLASSIFIED

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate): Rate: 15 words or less, \$4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.): Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. \$7.95, add \$1.75 S&H; Foreign Surface Mail, add \$2.75; Foreign Airmail, \$5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoy's, Hornets, others. \$8 postpaid U.S., Foreign \$20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Sharon, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 3,000 different Foto-Paaks and 6,000+ drawings. Catalogue \$3. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

FOR SALE: 40 *Popular Aviation* 1929-1941, MAN, FA, AT, Cleveland Plans. \$1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

INTERNATIONAL AIRCRAFT RESEARCH—NEED DOCUMENTATION? Include name of aircraft for availability of documentation with \$3 for 3-view and photo catalogue. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

HELICOPTER SCHOOL: 5 days of hands-on instructions with XL Helicopters and Futaba computer radios. Small classes, tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 50 satisfied students and 1,700 flights logged in our first (5) months of operation. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Send for FREE information and Class schedule now to R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-0727 or call (904) 698-4275.

AERIALS—AERIALS—AERIALS! Video Transmitter Plans, \$9.95; How-To Video, \$14.95; 7-ounce Minicam, \$189. Call us today! SUPERCIRCUITS (213) 372-9166.

USED ENGINES WANTED—Ignition, glow, diesel. Send description and price for prompt reply. T.Crouss, 100 Smyrna St., West Springfield, MA 01089.

SCALE DOCUMENTATION: Plan Enlarging. 87 Super-scale Giant, Sport R/C construction plans; three views; cutaway drawings; 70,000 documentation photos in stock. 100 page catalogue, \$5 (\$9 Air overseas). Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403. (919) 292-5239. Visa/Mastercard.

WANTED: Kyosho, Eureka, Aristo-Craft, Super Constellation Kit and other multi-engine kits; B-25, C-124, etc. Peter Pizzorno, 6130 Lake Ave., Orchard Park, NY 14127.

INVENTING! You are doing it now! Let us show you how to bring in cash. Free info. Kohler, Box 278-A, Twinsburg, OH 44278.

SWAP & SELL BARGAIN SHEET: Hundreds of items offered or wanted by modelers just like you! \$2.50 per month or \$20 per year subscription. Check or money order to: Bargain Publications, 1050 Faust Dr., Caro, MI 48723. Listing your items is free! Just call (517) 673-7116 or send the information to the address above.

WANTED: Plan for sport autogyro airplanes Gyroflyer I and II sold by C. Fredrick Campbell in late 70s. Ray Levesque, P.O. Box 76, S. Lancaster, MA 01651.

FOR SALE: model airplane kits, engines, magazines and many other accessories. For list, send \$1 and SASE to: Jim G. 132-53 114 St., Queens, NY 11420.

EASY TO BUILD TRANSMITTER BOXES: single and double plans; both for \$4. Hud's Plans, P.O. Box 47203, Doraville, GA 30340.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale: *Popular Aviation*; *Model Airplane News*; *Air Trails*; *RAF Flying Review*; *Wings*, and many others (1932-1960). All in excellent condition. For list, send \$2 to William C. Fort, Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

WANTED: old proportional R/C systems; special interest in SPAR, C&S DIGICON, DEANS, INTERGRATED DESIGN, GALAXY, QUADRUPLEX MARK II and others. Ron Gwara, 21 Circle Dr., Waverly, NY 14892. (607) 565-7486.

HARDWARE, SOCKET-HEAD CAP SCREWS @ excellent prices. Example: alloy socket-head cap screws 4-40x1/2, \$4.15/100; or stainless, \$5.95/100. For free catalogue, write to Micro Fasteners, P.O. Box 42, Netcong, NJ 07857; or telephone (201) 347-2349

MEGOW MODEL KITS—Wanted: airplane, boat, or railroad. Bob, Rt. 1, Box 1960, Hahira, GA 31632.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

TV TRANSMITTER

BROADCAST PROFESSIONAL COLOR VIDEO & AUDIO 2 MILES SUPERB 2 RATE 12 VOLT TV TRANSMITTER IS 4 1/2" x 1 1/2" WEIGHS 4 OUNCES. TUNES UHF 14-18 PLUS AMATEUR TV 100'S OF USES. COMPLETE STEP-BY-STEP PLANS INCLUDE HIGH AND LOW POWER VERSIONS. PLUS INEXPENSIVE MICROCAM AND KIT INFORMATION. PERFECT FOR AERIAL WORK AND WIRELESS CAMERA LINKS. BEST & EASIEST. BUILD FOR UNDER \$100!

New!

AIRBORNE
COLOR TV
TRANSMITTER

For Complete Plans, Send \$9.95 + \$3.00 First Class S/H to:
SUPERCIRCUITS
1403-B Bayview Dr., Hermosa Beach, CA 90254
(213) 372-9166

Satisfaction Guaranteed or Your Money Back
May Require License to Operate in Your Area

FREE

An offer you shouldn't refuse.

We've been in the covering business since 1968. We're committed to helping you succeed. So, we've written a booklet on the subject: "Tips On Covering". It contains techniques, do's & don'ts, trouble-shooter solutions, and secrets gathered from the best "finishers" in the world. **To get your copy free**, just send a self-addressed, stamped business-size envelope plus the circle in the upper left hand corner of the instruction sheet that comes with our new LOW-TEMP Black Baron film. Mail to Coverite, 420 Babylon Rd., Horsham, PA 19044. Here's what the circle looks like:



The truth about film coverings.

Manufacturers all claim their film goes on easy, stays drum tight, never gets hanger rash, middle age sag, or wrinkles. Have they ever gone to a flying field in July? What causes all those models to look like Del Monte prunes?

The bugaboo is heat.

The simple truth is that the more heat you apply to **any** plastic film, the less chance it has to succeed. This fact is obvious after a few months go by. The film might look great while going on, but after a while, the heat-stressed film begins to poop out. Hello bubbles, hello sags! If you've really cooked your film, it gets so brittle, it can shatter like glass on impact!

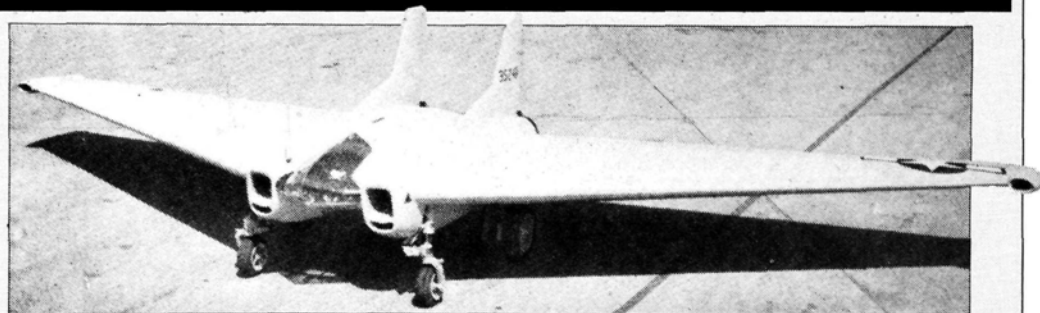
The solution.

Of the 3 most popular films, only one goes on with low heat. That's Black Baron Film. Originally, Black Baron required the same high heat as the others - close to 300°! But new Black Baron goes on at 230°! It not only sticks at this temp, it shrinks fully, as well. Less heat, less stress, much better long term stability.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name that Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Dan Lutz of Fallbrook, CA, for correctly identifying the Waterman "Aerobile" shown in the November '90 issue. This 1935, two-place, roadworthy cabin monoplane was powered by a 100hp, Studebaker-Waterman, 6-cylinder, in-line, water-cooled engine in a pusher configuration. Tailless and with detachable wings, it could be converted into a driveable coupe in about 3 minutes!

The fuselage was of a conventional steel-tube construction and covered, for the most part, with aluminum-alloy sheet. The swept-back wing had a wooden spar, was braced externally and had both metal- and fabric-covered surfaces. The Aerobile had small fins and rudders at its wing tips, and these could be deflected outward simultaneously to act

as air brakes.

Its wingspan was 38 feet; it was 19 feet, 4 inches long, and its overall height was 8 feet, 8 inches. It carried 25 U.S. gallons in two fuel tanks and had a cruising speed of 102mph, a range of 350 miles, and a climb rate of 600 feet per minute.



To drive it on the highway, the wings and airscrew were removed, and the engine was attached to the wheels by means of a series of "V" belts. If the airscrew was left in place, a clutch prevented it from spinning.

There were 26 other correct entries received and a few near misses. The most common error was to call it the "Arrowmobile." Thanks to all those who sent in entries.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

GIANT STEPS

(Continued from page 124)

and the covering is then securely sealed to the structure.

You can use materials such as Balsarite*, but it's much more economical to use a commercial adhesive and thin it with acetone so it can be applied with a brush. You'll be working with highly flammable and possibly toxic chemicals, so make sure that you avoid skin contact and have adequate ventilation. (Both the Dacron and the commercial adhesive are available from aviation and home builders' supply houses. One of the best is Aircraft Spruce & Specialty Co., Box 424, Fullerton, CA 92632; [714] 870-7551. They have an excellent catalogue. Send a large [9x12] SASE and \$3, which will be credited to your first order.)

Making the sock isn't terribly complicated, and it only takes a few minutes. Lay out a few stations (reference points) on the structure (perhaps at the formers), and measure and note the circumference of the fuselage at each former. After

you've taken the measurements, it's easy to lay out the sock's dimensions on a piece of lightweight Dacron. Then, sew the seam, and the sock is complete. (Note: leave a little extra material at the narrow end of the sock so that you can pull it onto the fuselage tightly.)

Although you can use an iron or a blower to seal the cloth to the underlying structure, I prefer to go over the areas where the structure touches the sock with a cloth dampened with acetone. This ensures good adhesion of the cloth to the structure's surface. When you've done this, you can cut away the openings (e.g., cockpit, wing saddle, etc.).

The quality of the covering job you'll achieve using this method will surprise you. Once you've tried it, you'll discover that you can adapt it to almost any model, and you'll have better coverings than you ever thought possible. One reader, who has become a convert, wrote that he has been spreading the gospel on how well the method works.

LANDING GEAR

I know of no substitute for the heavy-duty piano wire we use for landing-gear legs. Many of the larger models use at least $\frac{5}{16}$ -inch wire and even more use $\frac{1}{4}$ -inch wire. Bending the wire can be tough, so you'll need a husky wire bender.

Customarily, we wrap the landing-gear joints with light copper wire and solder them into place. To wrap these joints, I've switched to what amounts to baling wire, and I use a solder that requires more heat. (Solders vary according to their heat requirements, and hardware stores can give you details on what's available.) The combination of a heavier wire and a hotter solder produces a much stronger landing-gear assembly than the usual materials.

It's a good idea to provide a way for the landing gear to separate from the fuselage during a severe landing. I usually fasten the gear onto my models in such a way that they can come off without tearing the bottom of the fuselage. It's better to suffer a few scrapes than to have to rebuild the landing-gear mounts. The Balsa

USA* Sopwith Pup uses grooved landing-gear plates, and the wires are trapped in these grooves by plastic hold-down strips and light screws. If the hold-downs break off during a rough landing, replacing them and the gear only takes a few minutes.

UPCOMING

Next month, I'll give details on how to prepare and paint Dacron covering. In the meantime, happy building (and happy flying to those of you who spend your winters in the sunbelt!)

**Here are the addresses of the companies mentioned in this article:*

Balsarite; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044.
Balsa USA, P.O. Box 164, Marinette, WI 54143.



R.O.A.R. STOCK Cyclone II

- Super strong magnets and thick can, combine to create the most massive amount of torque available in a stock motor.
- Precision machine wound to highest specifications.
- R.O.A.R. legal, 27 turns.
- Speed ? Warp Factor 5 (25,000 RPM).
- Don't be beaten with the rest. Get the best!

ONLY \$25.00

Use Cyclone II
Or Be Beaten!



parma
INTERNATIONAL INC.

Send \$2.00 For A "MEGA" Color Catalog
13927-M Progress Pkwy., N. Royalton Ohio 44133

MODEL AIRPLANE NEWS R/C T-SHIRT

SHOW YOUR COLORS!

The next time you go to the local flying field, make a fashion statement with one of these new, crew-neck T-shirts from Model Airplane News! They're 100% heavyweight, preshrunk cotton and made in the USA. The time to add this super "T" to your collection of duds is now! Sizes: Medium, Large, Extra Large, XX Large (\$2 more).

Price: \$12.95

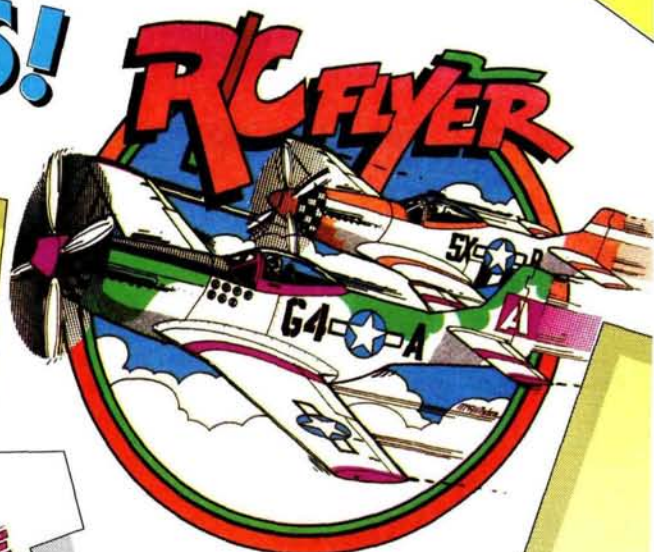
Credit-card orders only, call TOLL-FREE:

1-800-243-6685
In CT: 834-2900

Use our handy order form on page 117.

Air Age Mail-Order Services, 251 Danbury Rd., Wilton, CT 06897

Postage and handling: U.S. customers add \$2.95 for first T-shirt; \$1 for each additional item. Foreign orders (including Canada and Mexico): airmail—add \$5.50 for first item, \$2.50 for each additional item; surface mail—\$3 for first item, \$1.50 for each additional item. Payment must be made in U.S. funds drawn on a U.S. bank. Connecticut residents add 8% sales tax.



BACK VIEW

A&S Industries	123
Ace R/C	11
Airtronics, Inc.	4
Alberta's Littlest Airport	111
Altech Marketing	C2
America's Hobby Center	97
Basics of R/C Airplanes	82
Basics of R/C Helicopters	106
Boca Bearing Co.	95
Bolar Heli Research	95
Bridi Aircraft Designs, Inc.	101
Byron Originals, Inc.	3.47
Carden Corporation	109
Carl Goldberg Models	70
Carlson Engine Imports	66
Chris Murphy Flight Jackets	116
Classified Directory	125
Cleveland Model and Hobby Supply	90
Coverite	125
Cox Hobbies	26-27
Dave Brown Products	13
David H. Klaus	124
Doylejet	66
Dremel	13
Dr. J's Hobby Warehouse	95
DuBro Products	67
Duracraft	119
Fox Manufacturing	63
Futaba Industries	23,80,C3
Glenn Aircraft	119
G.M. Precision Products, Inc.	123
Great Planes Models	75
Historic Aviation	43
Hobbico	38
Hobby Dynamics	107
Hobby Lobby International	104,105
Hobby Shop Directory	130
Innovative Modeling Products	123
Island Hobbies	63
Jet Hangar Hobbies	54
J'Tec	119
K&B Manufacturing, Inc.	123
K&S Engineering	78
Knights of the Air	116
Kress Jets, Inc.	111
Kyosho	15
Landing Products	12
Mail Order Form	117
Major Decals	11
M.A.N. Back Issues	114-115
M.A.N. Books	128-129
M.A.N. Decals	111
M.A.N. 400 Great Modeling Tips	118
M.A.N. Plans	120-121
M.A.N. Prints	55
M.A.N. Subscription	18
M.A.N. T-Shirts	127
M.A.N. Trainer Pak	109
M.A.N. Watches	108
Midwest Products, Inc.	46
Minimax	108
Model Rectifier Corporation	30
O.S. Engines	C4
Pacer Technologies	68,110
PanaVise	66
Paradise Flight School	9
Parma International	127
R/C Airplane Buyers' Guide	87
R/C Video Review Magazine	90
RCD Inc.	54
Robart Manufacturing	77
Rocket City R/C	116
Royal Products	36
Sherline Products	79
Sig Manufacturing	28
Tatone, Inc.	75
Technopower II, Inc.	8
Telelite Corporation	119
The Airplane Factory	66
Top Flite Models, Inc.	86
Tower Hobbies	7
Tri-City Soarers	78
Triton Models	63
Ultimate Hobbies	119
Vailly Aviation	78
Watkins Aviation, Inc.	123
Williams Brothers, Inc.	78
Wing Manufacturing	124
Young Enterprises	75
Zenith Aviation	19

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!

Directory space is sold on a yearly basis with a choice of three payment plans: 1. \$179 per year, payable in advance; 2. \$97 for six months, payable in advance; or 3. \$17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

ALABAMA—Huntsville

4.5 miles east of the Alabama Space and Rocket Center. Complete line of Radio-Control, Free-Flight, and Control-Line Airplanes and Hardware, HO&N Scale Trains, Rockets, Ships, and Plastics. Hours: Mon-Fri, 9-6; Sat, 8-5; Sun, 12-5. Daily UPS pickup.

WILSON'S HOBBY SHOP

117 Governors Dr. (205) 539-2259

CALIFORNIA—Torrance/Gardenia

Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Near LAX. Owner: John Eaton.

MODEL CENTER

2304 Redondo Beach Blvd. (213) 327-3862

CONNECTICUT—Bristol

15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two- and four-cycle engines. All major items discounted. Hours: Mon, Tue, Wed., 10-7; Thu., 10-8; Sat., 10-5:30; Sun, Nov.-Jan. 1-4.

BRISTOL HOBBY CENTER

641 Farmington Ave., Rte. 6 (203) 583-7273

CONNECTICUT—Norwalk

Connecticut's leading R/C shop. 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.

AL'S R/C SUPPLIES

54 Chestnut Hill Rd. (203) 846-9090

FLORIDA—Winter Springs

- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Send \$2 for yellow info pack
- NEW—custom building service
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.

420 W. S.R. 434 (407) 327-6353
FAX (407) 327-7148

ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon-Fri, 10-9; Sat, 9-6; Sun, 11-4.

STANTON HOBBY SHOP, INC.

4734 Milwaukee Ave. (312) 283-6446

OHIO—Findlay

Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.

JINX MODEL SUPPLIES

721 Rockwell Ave. (419) 422-5589

OKLAHOMA—Tulsa

R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.

WINGS 'N THINGS HOBBY SUPPLY, INC.

5241 S. Peoria Ave. (918) 745-0034

TEXAS—Austin

Austin's largest hobby shop. Complete line of R/C airplanes, gliders, cars, boats, helicopters, parts & accessories, rockets, kites, R/C systems. Centrally located. Open 7 days a week.

AMERICAN ANGLER TACKLE & R/C HOBBY CENTER

1617 Toomey Rd. (512) 474-8277

TEXAS—Houston

R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.

LARRY'S HOBBIES

156-F FM 1960 E. (713) 443-7373

LATIN AMERICA

COSTA RICA—San Jose

Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.

EL HOBBY SHOP

Centro Commercial, San Jose 2000
Apartado 529, Centro Colon 32-26-81

Send sales message and payment to **Model Airplane News Hobby Shop Directory**, 251 Danbury Rd., Wilton, CT 06897.

For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Laura Kidder.



**SPECIAL
ONLY \$6.50
3 FOR \$18.
SAVE 20%**

BINDERS WITH CLASS!

These beautiful red and gold binders are a perfect way to file your Model Airplane News magazines or books. Each binder has metal spines for holding twelve issues or several books which can be easily inserted or removed. Order yours today!

U.S. Postage: Include \$2 per binder for UPS shipping. (Binders will be sent third class if undeliverable by UPS.) Foreign: Include \$3 per binder for foreign book rate.

Air Age Mail-Order Services, 251 Danbury Rd., Wilton, CT 06897